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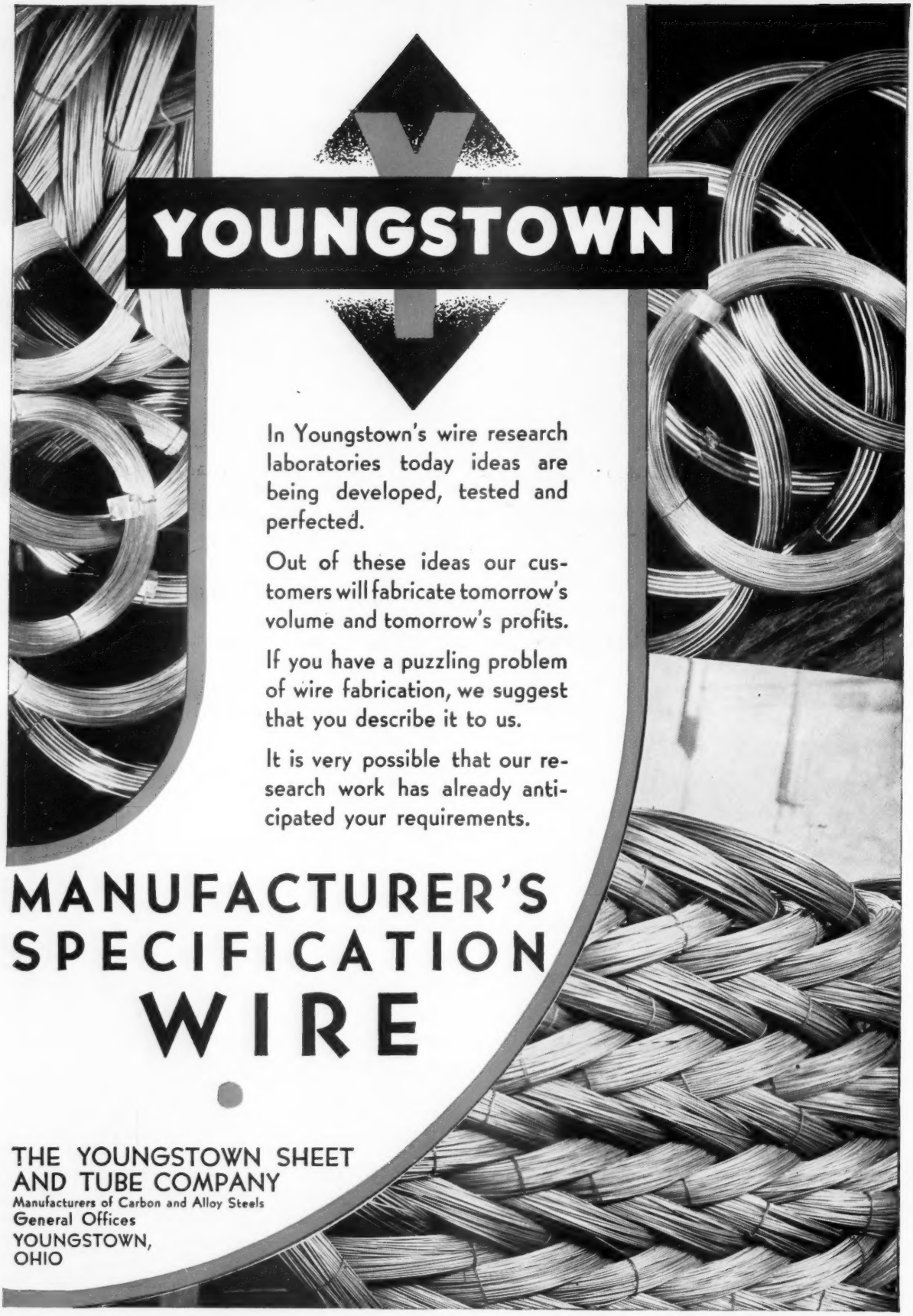
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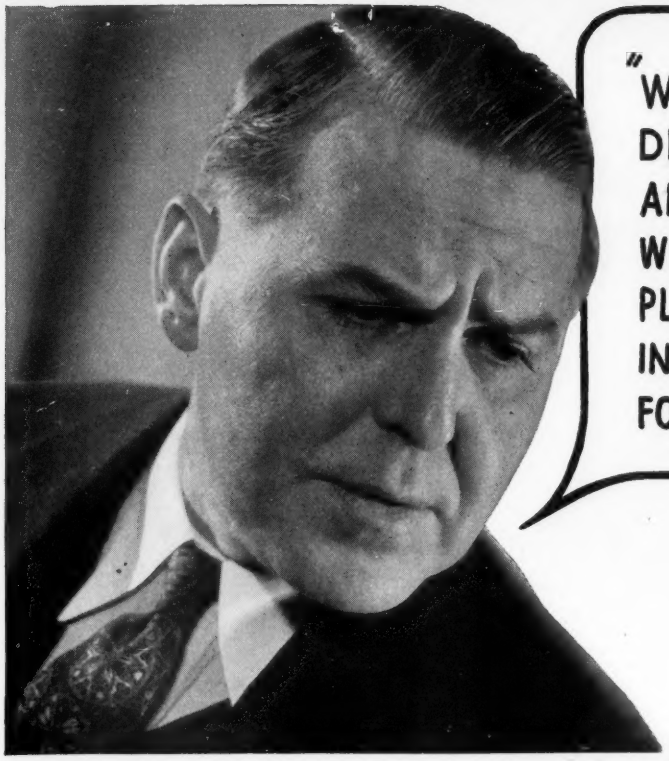

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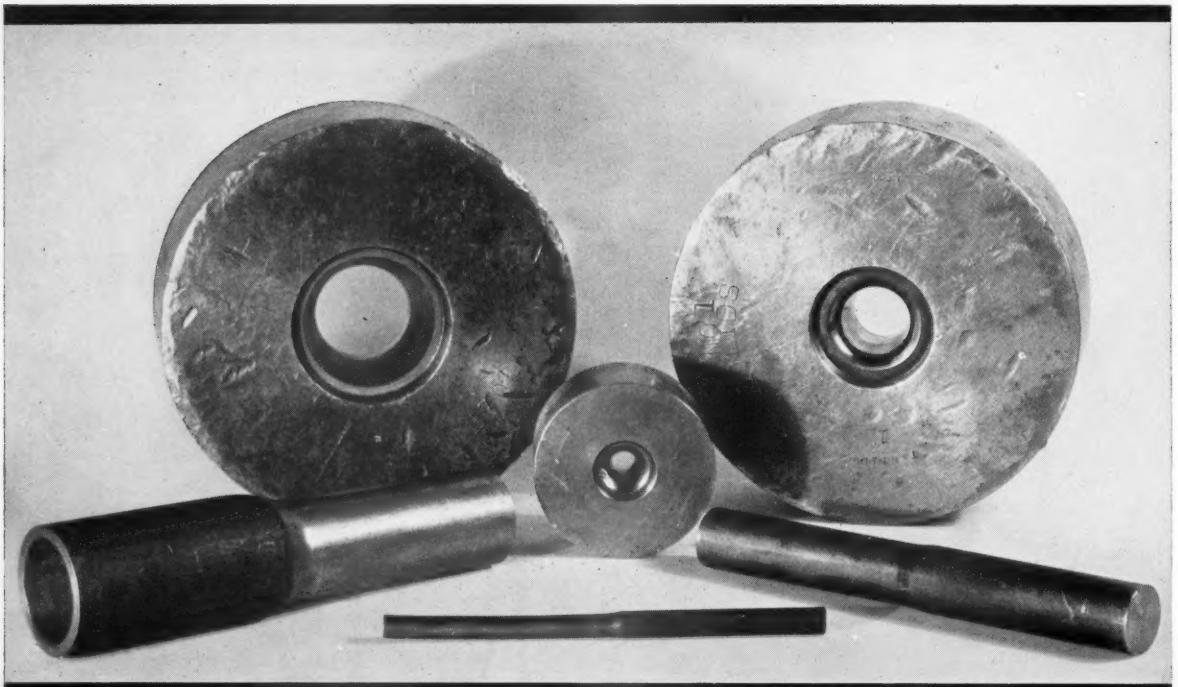

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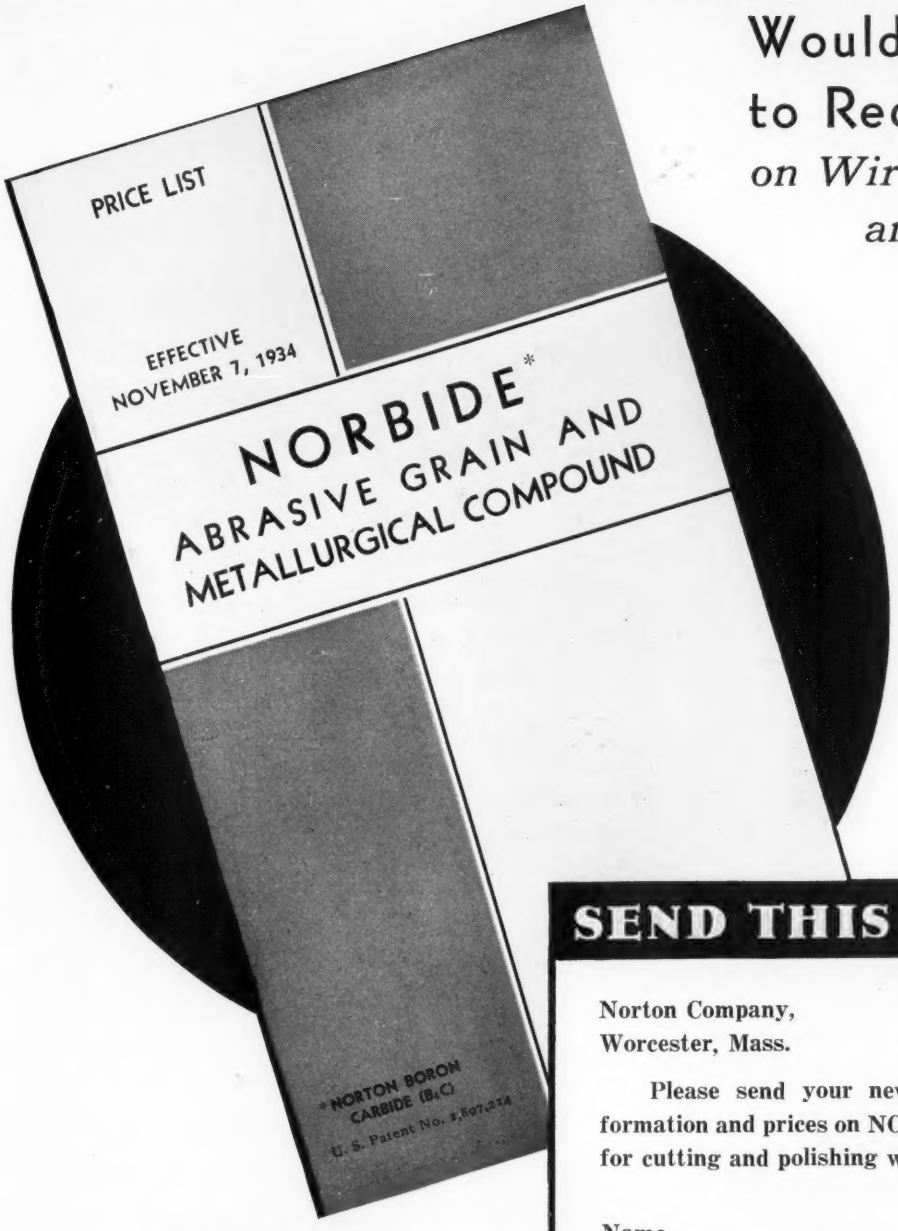

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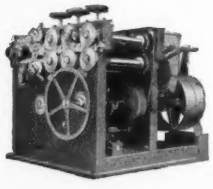

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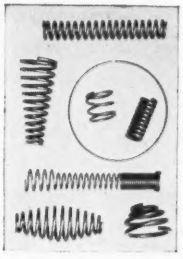

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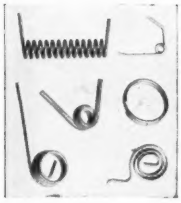

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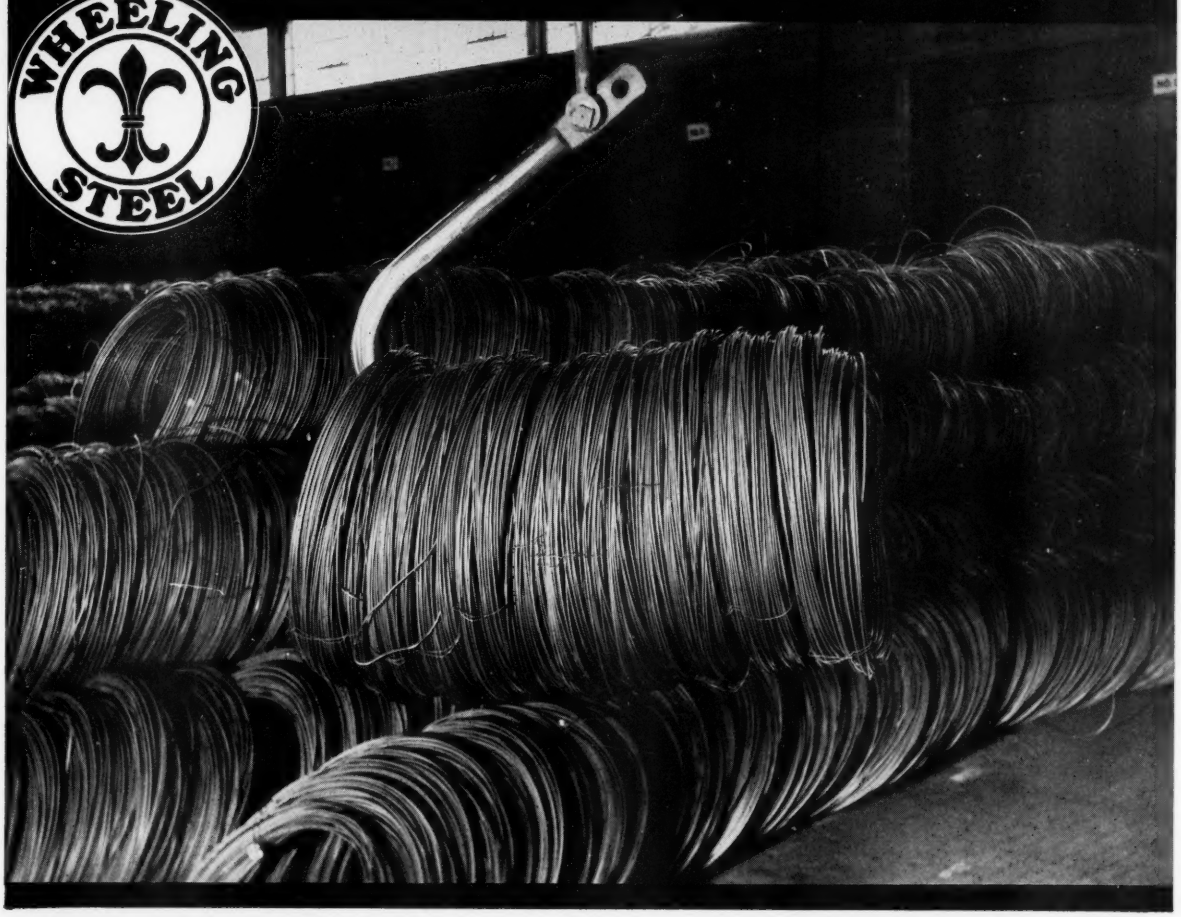

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WIRE AND WIRE PRODUCTS

Vol. 10 May 1935 No. 5

Designated as
Official Publication By The Wire Association

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will be at the
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17 East 42nd St., New York, N. Y.

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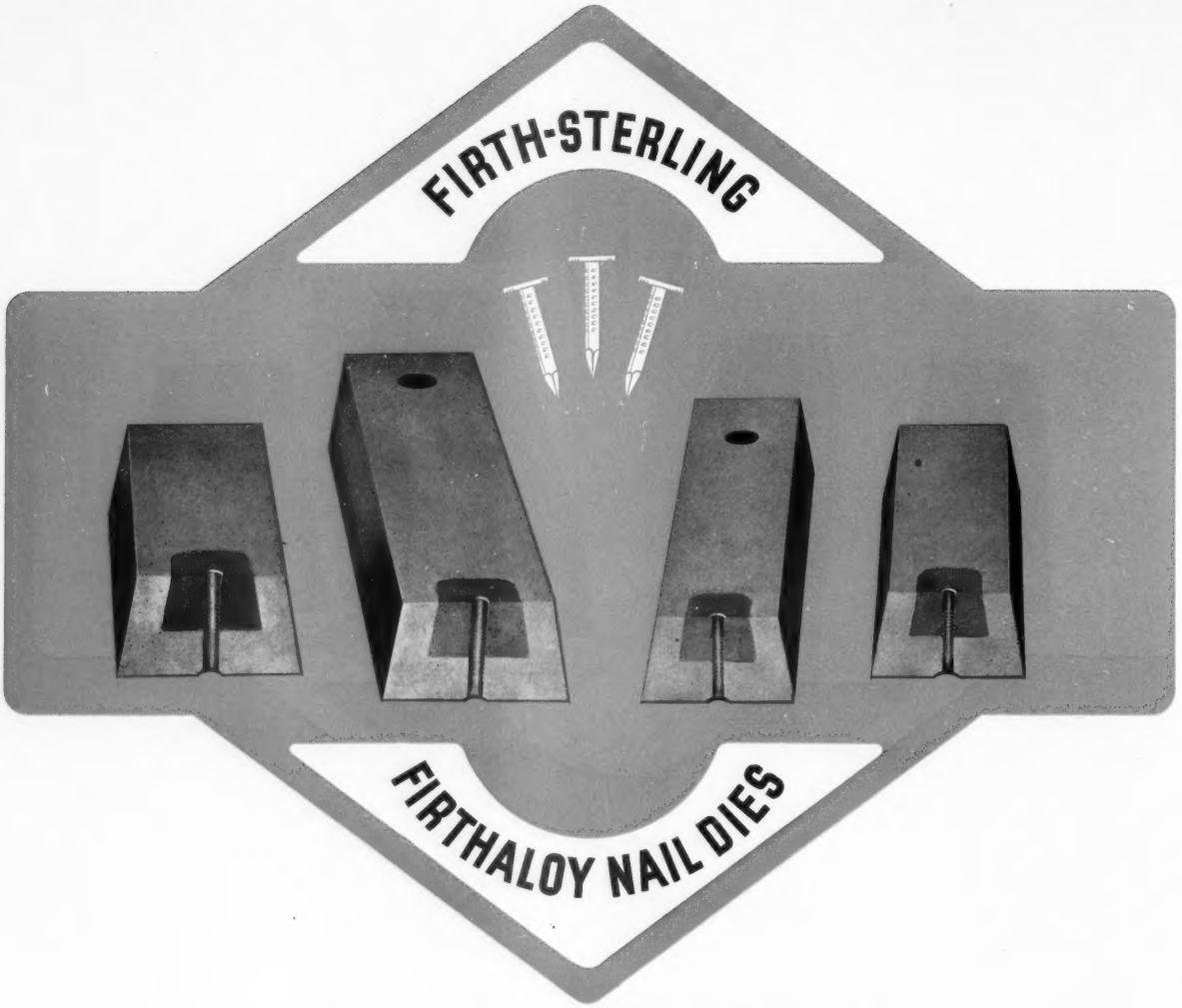

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A monthly publication devoted to the production of Wire, Rod and Strip.
Wire Products and Insulated Wire and Cable.
DRAWING --- ROLLING--- EXTRUDING --- FORMING --- FABRICATING

Vol. 10 MAY 1935 No. 5

Rod Baking By Direct Fired Recirculation

By J. R. Morrison

Morrison Engineering Co., Cleveland, Ohio

A short outline of the heating of ovens or bakers by direct fired recirculation. Any type of fuel may be used. ✦ ✦ ✦

THE theory that rod bakers must be fired by some indirect means has been exploded once and for all.

✦ ✦ ✦

ROD bakers have been in successful operation for over two years that are heated by this patented direct fired recirculation system.

✦ ✦ ✦

THE heating of ovens or bakers by direct fired recirculation method must not be confused with what is commonly known as direct firing by burners, that is, where the burners are located inside of the bakers themselves.

✦ ✦ ✦

WHAT a recirculation? A dictionary might define it as "the act of repeatedly moving by a circuitous route back to the starting point." The heating engineer calls it the most efficient way of transferring convected heat.

✦ ✦ ✦

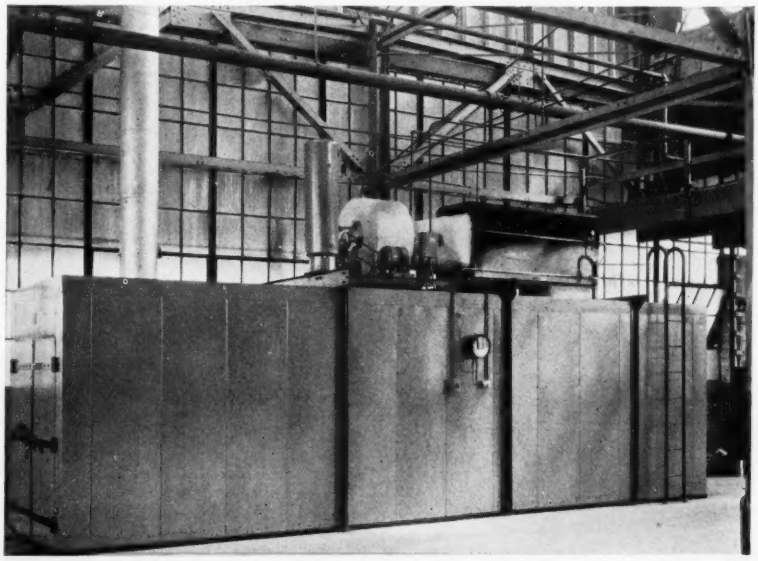
IT is now an accepted fact in most industries that the use of direct fired recirculation heaters have lowered costs to an unheard of level and at the same time has raised the standard of quality. It is apparent therefore, that there is much more to this method of heating than can be explained by a simple definition.

✦ ✦ ✦

IT is well recognized today that any heating process within its range can be heated most efficiently by forced convection and convection heating practically means direct fired recirculation.

✦ ✦ ✦

THERE are several reasons for this. In order to bring these points out more clearly, we shall describe the process of heating by recirculation and show what actually takes place.



Exterior View of Rod Baker. ✦ ✦ ✦ ✦ ✦ ✦ ✦

Designated as Official Publication by the Wire Association

CONVECTION heating, of course, is done by means of air. Air is drawn into the heater where it comes into intimate contact with the flame and hot combustion gases and is heated very rapidly. The heated air, together with the products of combustion, then enters the baker under a slight pressure through suitably placed ductwork and quickly diffuses to all parts of the baker. Having given up part of its heat, the air returns through another system of ducts to the heater, where the cycle is repeated.

✦ ✦ ✦

IT is necessary to vent to the outside atmosphere only enough of the air and gases to insure evacuation of water vapor and admit enough fresh air to secure sufficient dilution of the products of combustion.

✦ ✦ ✦

AS an illustration, let us assume that we are going to heat a baker to a temperature of 350° F. We will assume further, that the air and combustion gases will leave the heater at a temperature of between 450° and 500° F.; upon entering the baker they will spread rapidly in all directions and maintain a temperature of 350° F. throughout the baker. Having given up part of its heat the air leaves the baker at approximately 350° F. and returns to the heater.

✦ ✦ ✦

Reason For Fuel Savings

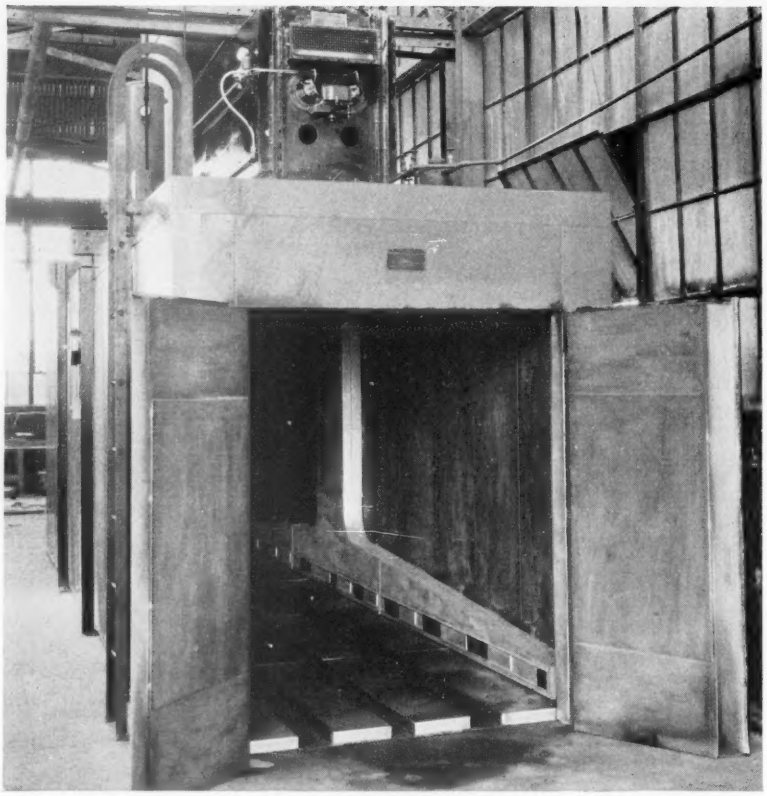
HERE is the secret of the fuel savings possible with direct fired recirculation. With other methods of air heating, the air is completely vented to the atmosphere after giving up part of its heat. With recirculation most of these gases return to the heater and it is only necessary to heat it from 350° to 500° instead of from 70° to 500°. The economies are obvious.

✦ ✦ ✦

WE have attempted to point out only the basic principles of recirculation heating showing a few reasons for its economy.

✦ ✦ ✦

ROD baking by the direct fired recirculation method has many other advantages but space will not permit of elaboration. Briefly these advantages are a much shorter bake, in some cases a reduction in time of 80%, a uniform product and the elimination of rusty and squeaky wire.



Interior View of Rod Baker.

✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦

✦ ✦ ✦

IT is important to note at this point that with forced convection heating, properly applied, the actual baker temperature will be absolutely uniform within very narrow limits. With other heating methods it is possible to show a uniform temperature at the thermo-couple and still have a great variation in different parts of the baker.

✦ ✦ ✦

A NUMBER of these patented, direct fired bakers are in operation, baking a wide range of materials with a variety of fuels. The accompanying photograph shows a baker fired with fuel oil and baking miscellaneous rods.

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A Correlation of the Tensile Strength and Electrical Conductivity of Hard-Drawn Copper Wire With Preferred Orientation

PART II

By Roy Ward Drier

Associate Professor of Metallurgy Head of Division of Roentgenology
Michigan College of Mining and Technology, Houghton, Michigan

Abstract

Wire drawing is reviewed from antiquity to the present, with particular emphasis on present day drawing of copper wire. Unit cell orientation is deduced from micrographs and various types of X-ray spectra. These orientations are correlated with electrical conductivity and tensile strength, and explanations for the variations due to cold drawing are formulated. Similar correlation is done for copper wire, cold-drawn in various manners. Tensile strength does not vary appreciably but the electrical conductivity seems to be higher for wire drawn continuously than for wire whose direction of drawing is reversed. ✦ ✦ ✦ ✦ ✦ ✦

*Ultimate Structure, Electrical Conductivity, and Tensile Strength

THE conductivity of copper wire is of prime importance to the electrical industry and, consequently, to the copper refiner and the wire manufacturer; tensile strength, though of lesser, is still of great importance. Annealed copper wire has a higher electrical conductivity than hard-drawn—often over 100 as compared with 96 or 97. Hard-drawn wire, conversely, has a tensile strength of 70,000 lb. per sq. in. as compared with 30,000 for annealed wire. The following experiments were carried on in an attempt to explain some of the reasons for these changes in properties, or at least to correlate the different structural conditions with the physical properties. ✦ ✦ ✦

Samples

THE samples selected for use in the diffraction work and resistivity measurements were taken from Nos. 6, 8, 10, and 12 gauge (B. & S.) commercial wire, both hard-drawn and annealed. The wire was produced from standard 220-lb. wire bars, hot-rolled to 5/16-in. and cold-drawn in one direction to size. In addition, observations were made on 10-gauge wire, which was drawn from a piece of native copper without melting. For annealing, the wires were kept at a temperature of 820° C for one hour and fifteen minutes. Table I gives the composition and conductivity of the wires in this first set of experiments.

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IN order to study the changes in ultimate structure from the surface to the core of the wire and to observe any variations in conductivity which may accompany these structural changes, observations were made on wires whose outer layers were removed in successive stages by dissolution in 25 per cent nitric acid. The etching was carried on in such a manner that the diameters of the wires were reduced in stages of approximately 0.5 mm. Various methods of etching were tried, all of which yielded identical results. The method which was finally adopted consisted of placing the wires in a nearly vertical position in a cylinder and causing them to rotate by mechanically circulating the solution. For each stage, after one-half of the etching was accomplished, the wire was turned end for end in the solution and the etching completed. It was generally observed that as the hard-drawn wires etched, the cross-section gradually became elliptical. The difference between the lengths of the major and the minor axes of the cross-section at the core was found to be as great as 50 per cent. It seems quite probable that this was residual from the last oval pass in the rolls. Some wires etched with annular rings. A microscopical examination of these rings at 1600 diameters failed to

TABLE I
Composition and Conductivities of Wires Discussed

Wire	Metal Content (Cu Ag.)	As	Conductivity (per cent)
No. 12 Hard drawn	99.94	.000378	97.7
No. 6 Hard drawn	99.94	.000378	97.8
No. 6 Annealed	99.93	.000370	99.8
No. 10 Hard drawn from Native Cu.	99.96	.000310	99.8
No. 10 Same as No. 10 above but annealed	99.96	.000310	102.5

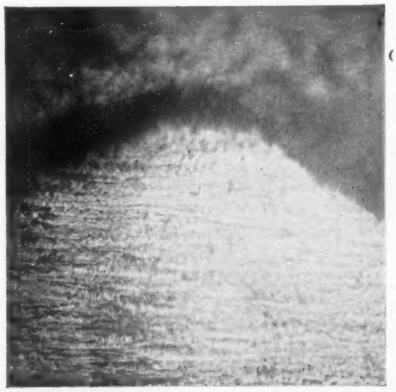

Fig. 1, 1600X—Micrograph of ringed portion of cross-section of wire which showed annual rings upon etching. ✦ ✦ ✦ ✦

*R. W. Drier and C. T. Eddy: Correlation of the Ultimate Structure of Hard-drawn Copper Wire with the Electrical Conductivity. Trans. A. I. M. E. (1930), 89, Institute of Metals Division.

show any peculiar structures not noticeable in the rest of the wire, and it was thought that possibly the rings were a result of chattering. (Fig. 1.)

✦ ✦ ✦

HULL diffraction patterns were obtained from samples immediately adjacent to those used for resistivity measurements. In addition, diffraction patterns were taken of the original wires (those used for the resistivity measurements) before etching and also after the last etching had been made and the resistivity determined. These latter patterns agreed precisely with the first and last patterns of the series made from a single wire. (Fig. 2.)

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A NUMBER of wires were ground off until a longitudinal section was exposed through the core. They were polished, etched, and examined microscopically at 1660 diameters. Micrographs of a section from the surface through the core to the opposite surface are given in Fig. 3. Elongated grains showing slip structure exist throughout the whole section, the grains being elongated in the direction of drawing. It will be seen that the slip lines make various angles with the drawing direction. Near the surfaces of the wire there prevails a 45° slip angle, with a few slip-lines at right angles to the wire axis. As the core is approached, the 45° angle disappears almost entirely, and the lines at 90° almost hold their own. Evidently the drawing deformation has effected at the core some type of orientation in which the planes of easiest slip do not make 45° with the drawing force. In fact, as the core is approached, slip-lines increasingly lack definition until they are not in evidence at all. This phenomenon will be considered later in the light of the orientations deduced from X-ray diffraction examination.

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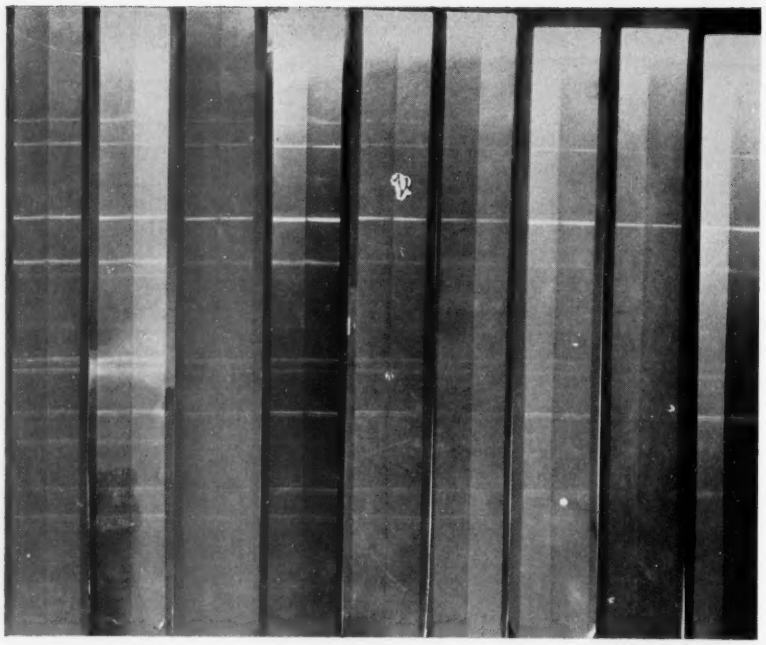
AN end cross-section of the wire was also polished and examined. No difference was noticeable across the wire, though the Rockwell hardness of the core was greater than that near the surface.



1 2 3 4 5 6 7 8 9

Fig. 2—Hull Spectra of No. 6 B. and S. Cold-Drawn Copper Wire in the Successive Stages of Etching. Diameter of Wire After Etching and Before Raying

1. 4.115 mm. 3. 2.96 mm. 5. 1.95 mm. 7. 0.45 mm.
2. 3.5 mm. 4. 2.35 mm. 6. 1.15 mm. 8. 0.25 mm.
9. 0.13 mm.

Diffraction

THE diffraction work was done on a General Electric unit, using a molybdenum, water-cooled target Coolidge tube which operated at 20 ma. and 30,000 volts. The familiar Hull cassette with Zirconium dioxide filters as an integral part of the cassette was used. The filters permit transmittance of radiation which approximates the monochromatic.

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POLYCHROMATIC pinhole spectra were also obtained of all samples, (Fig. 4.) and several spectra were made of some of the cores, rotating crystal and oscillating crystal methods being used. (Fig. 5.)

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IN obtaining the Hull spectra, of the larger wires at least, the sample was so placed that the X-rays just grazed the surface of the wire. As the wires were reduced by etching, they finally arrived at the size at which the X-ray beam was wider than the sample and so bathed both sides. Both Hull and pinhole spectra were obtained of the surface of all wires after each etching. The patterns were so similar that a single series can be used as representative of them all. Fig. 2 shows such a representative series of Hull spectra. It includes the diffraction spectra of the No. 6 B. & S. hard-drawn wire after each separate etching, from the original diameter of 4.12 mm. to its final stage of 0.09 mm. Figs. 6-10, 6-11, and 6-12 show the Hull spectra of No. 6 B. & S. commercially annealed copper wire at the surface and at the core. The similarity among these last three agrees with accepted theories concerning annealed wires.

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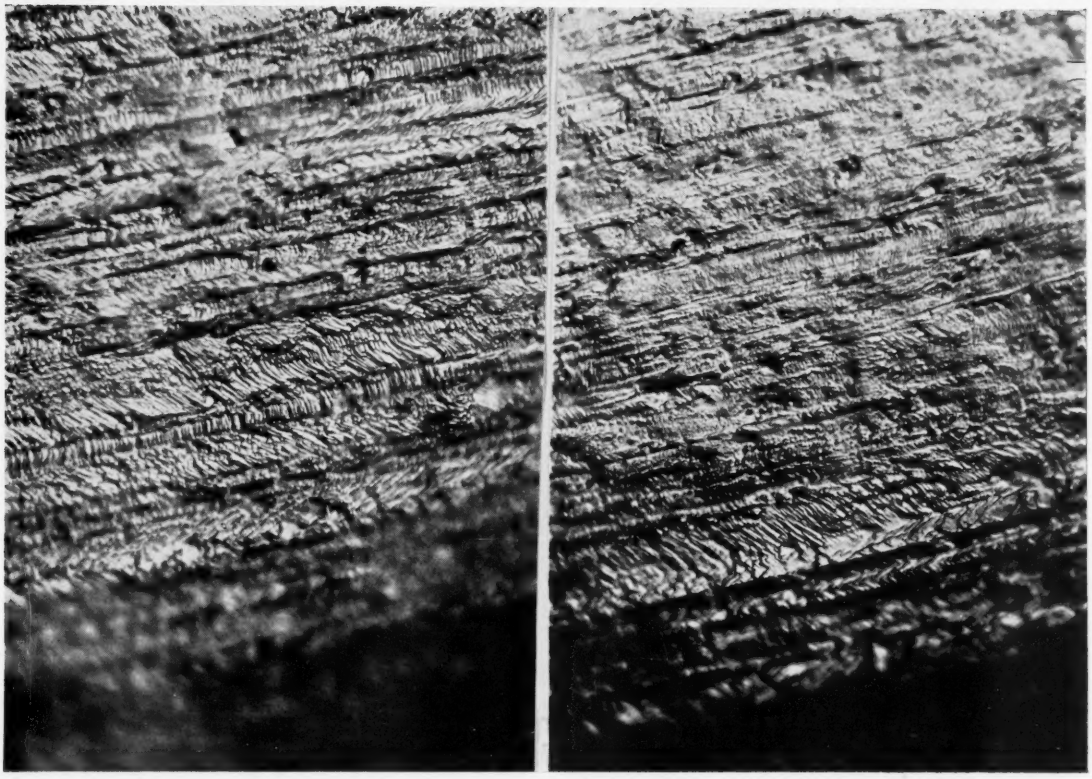
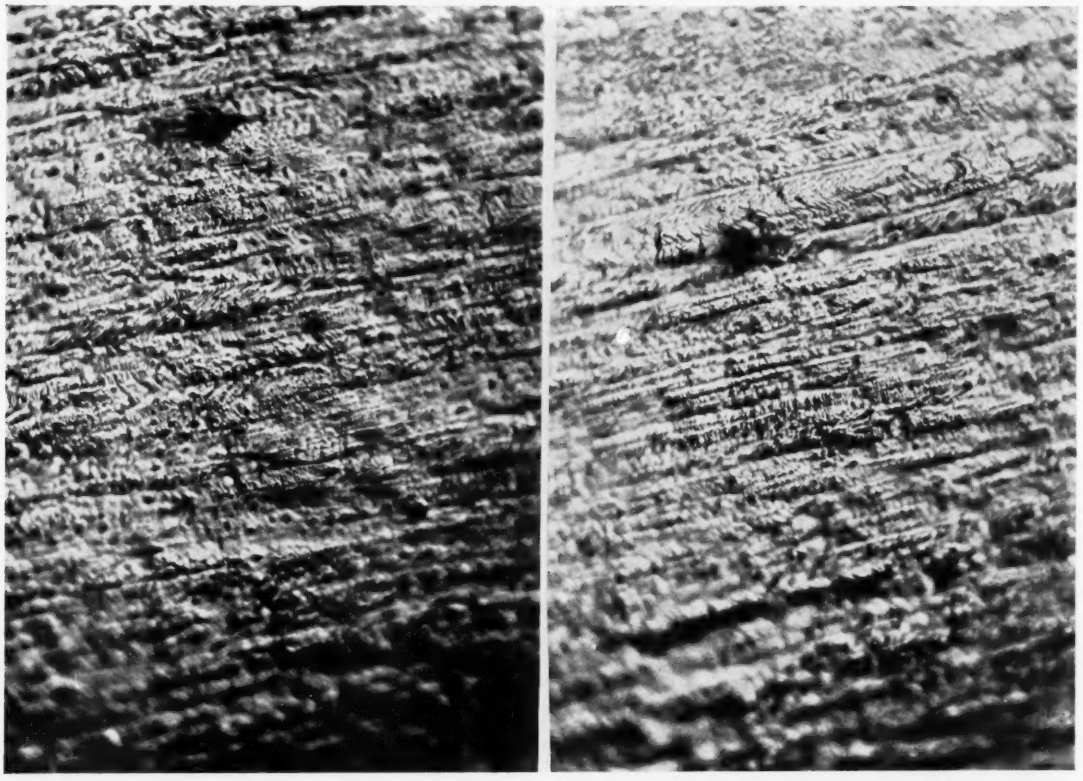
FIG. 7 shows two spectra and one micrograph of wire annealed at from 1060° to 1080°C. These spectra indicate not only recrystallization but also a preferred orientation. This is in accord with the theory that hard-drawn copper wire assumes a fiber type of orientation if annealed above 1000°C.



1 2

Fig. 3. 1600-X—First Two of a Series of Nine Micrographs Which Includes the Entire Cross-Section of a Wire. ✦ ✦ ✦



3 4

Fig. 3. Cont.—Second Two of a Series of Nine Micrographs Which Includes the Entire Cross-Section of a Wire. ✦ ✦ ✦

Twinning is most prevalent at 90° to the wire axis.

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IN the Hull spectrum series of each of the hard-drawn wires, a certain variation in the relative intensities of the spectral lines was noticed. The reflections from the 200 planes do not vary appreciably in their relative intensities. The reflections from the 111 planes decrease from an intensity practically equal to that of the 110 reflection to an absolute absence. As would be expected, the variations in the intensities of the reflections from the fictitious planes 222 and 333 correspond to the variations in the intensities from the 111 planes. This is not quite true of the line which seemingly comes from the 333 planes. Inasmuch as the d_{333} and the d_{511} are the same, the reflections from both fall on the same

5

Fig. 3. Cont. 1600-X—Fifth of a Series of Nine Micrographs Which Includes the Entire Cross-Section of a Wire. This is a Micrograph of the Core. ✦ ✦ ✦ ✦ ✦ ✦

6

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Fig. 3. Cont. 1600-X—Sixth and Seventh of a Series of Nine Micrographs Which Includes the Entire Cross-Section of a Wire. ✦

place on the film, and because of the 511 planes a small intensity will be expected for this line. By the time the last etching reduction is finished the reflections from the 220 planes practically double their intensity and those from the 311 planes are reduced to approximately half-intensity.

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THE reason for these variations is readily seen by an inspection of the pinhole spectra in Fig. 4. From them one notes that at the surface is a very thin layer of preferredly oriented material, below which is randomly oriented material. As the core is approached the unit cells in the wire are again becoming preferentially oriented. The spectra of the copper

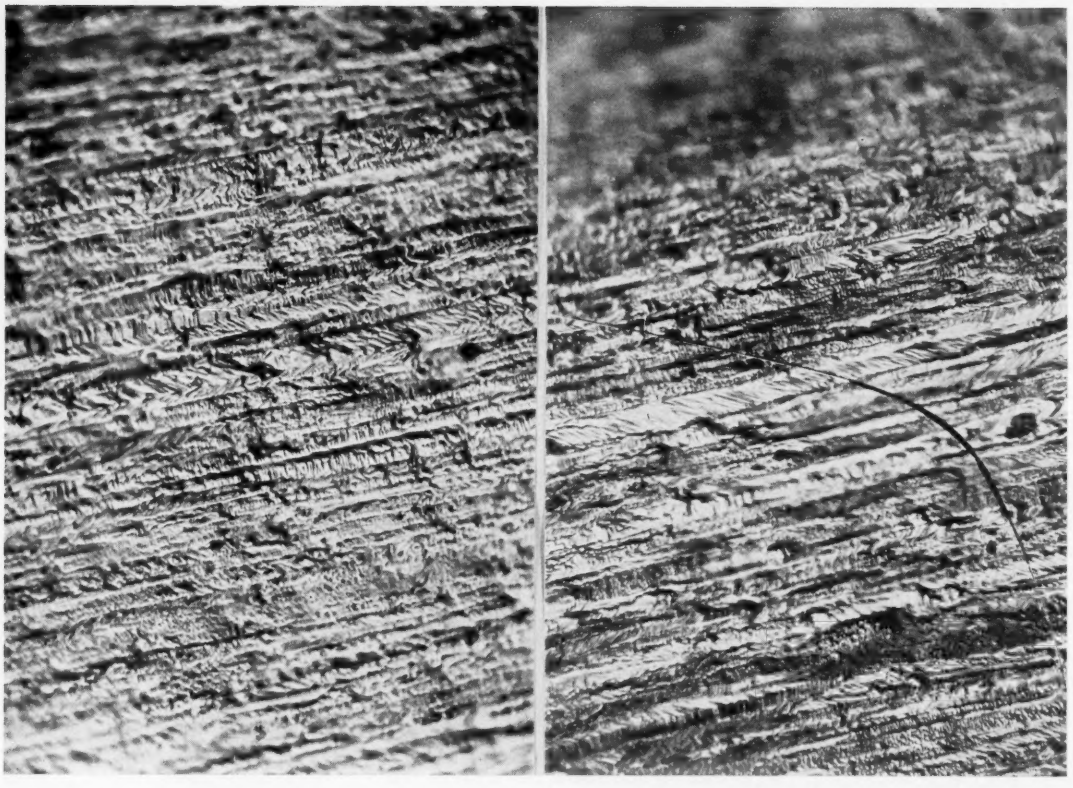

Fig. 3. Cont. 1600-X—Eighth and Ninth of a Series of Nine Micrographs Which Includes the Entire Cross-Section of a Wire.

just below the surface are composed of complete circles, indicating random orientation, and those from nearer the core seem to have the total intensity of each circle concentrated at certain spots in the circle. The pinhole spectra and also the Hull spectra, which are merely radial sections of pinhole spectra, closely resemble in nature the spectra of fibrous materials, such as asbestos.

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THE preferential orientation first appeared when a diameter of 2.35 mm was reached; this is in fair agreement with Wood's [6] conclusions that the core of a hard-drawn copper wire has a diameter of from 60 to 40 per cent of the total diameter, varying inversely with the degree of cold reduction to which the wire has been subjected. A Bernal [23] analysis of the pinhole spectra showed that the spectral spots which are present are from planes which would reflect if the unit cells were so oriented that either the 100 direction or the 111 direction would be parallel to the direction of drawing,

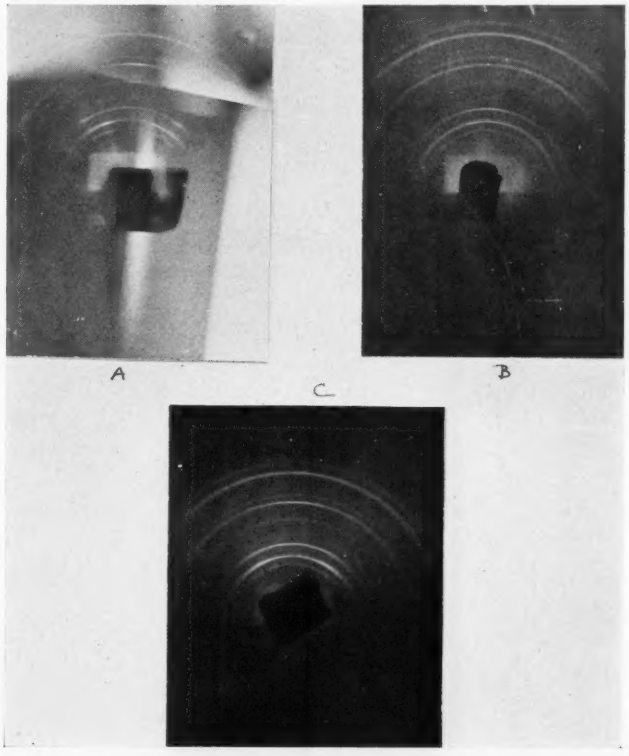

Fig. 4—First Three of a Series of Nine Polychromatic Pinhole Spectra Representing the Structure of Hard-Drawn Copper Wire as One Penetrates from Surface to Core. Note that "a" shows a Preferred Orientation at the Surface.

or in other words to the longitudinal axis of the wire. There is a slight asymmetry of the spots which indicates that the arrangement is not one of exact parallelism but rather one of a conical nature (Fig. 4-g, h, and i).

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A COMPARISON of the spots which are representative of 111 orientation with those of the 100 indicates that the 111 orientations seem to be twice as prevalent. This compares favorably with Schmidt and Wasserman's [7] 60-40 and with Glocker's [8] 50-50 relative importance of the two. The extreme outer surface of the hard-drawn wire has a thin layer of material with a preferential orientation similar to the orientation of the core (Fig. 4a). This is in accord with the conductivities determined and with the results obtained by Harris [9] in his work on the distribution of tensile strength in hard-drawn copper wire. He found that a thin surface layer has a high tensile strength, which decreases as much as 50 per cent for the material between the surface and the core (core diameter being approximately one-half the total wire diameter) and then rises abruptly and remains fairly constant for the core.

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Resistivity Measurements

FOR the determination of the changes in specific resistivity throughout the sections of the wires, measurements were made on the original wires before etching and on the wires after each successive etching.

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THE potentiometric method was used and direct e. m. f. readings were made to 10^{-6} volts. The wires were placed in a special bridge, and mercury end contacts were used to insure parallel lines of flow (especially for the heavier wires). A definite current, accurately measured, was passed through the wires, and the drop in potential between two intermediate knife-edge contacts was measured on a Leeds & Northrup Type K Potentiometer. The distance between the knife edges was accurately adjusted, and was kept constant for all observations.

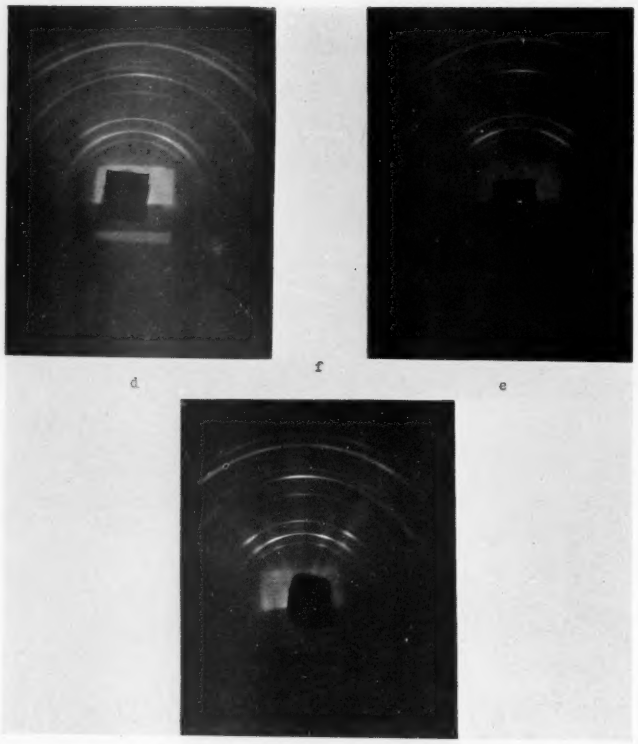


Fig. 4. Cont.—Fourth, Fifth and Sixth of a Series of Nine Polychromatic Pinhole Spectra Representing the Structure of Hard-Drawn Copper Wire as One Penetrates from Surface to Core. Preferred Orientation is Very Apparent in "f", which is a Spectrum of the Outer Part of the Core Area. ✦ ✦

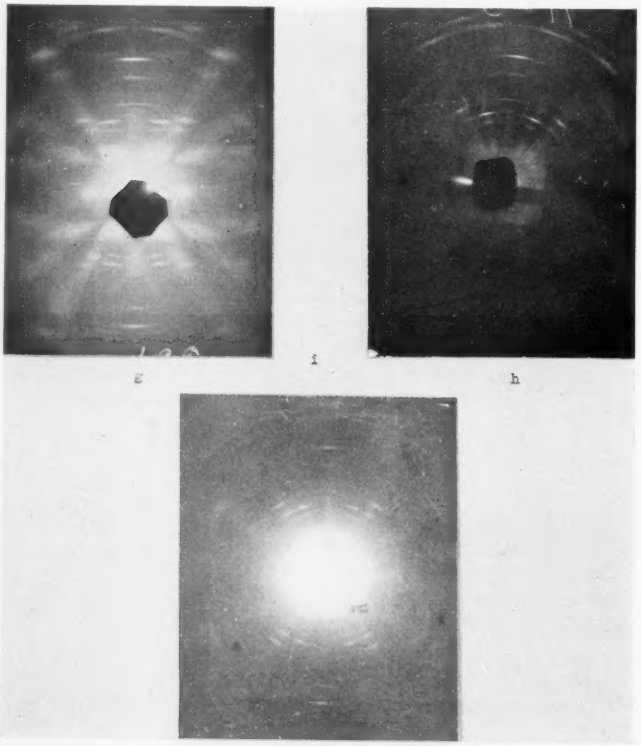


Fig. 4. Cont.—Seventh, Eighth and Ninth of a Series of Nine Polychromatic Pinhole Spectra Representing the Structure of Hard-Drawn Copper Wire as One Penetrates from Surface to Core. The Shortening of the Intensity Maxima Indicate that the Orientation is More Preferred as the Center of the Core is Approached. These Three Show Assymmetry Due to the Conical Orientation. ✦ ✦ ✦

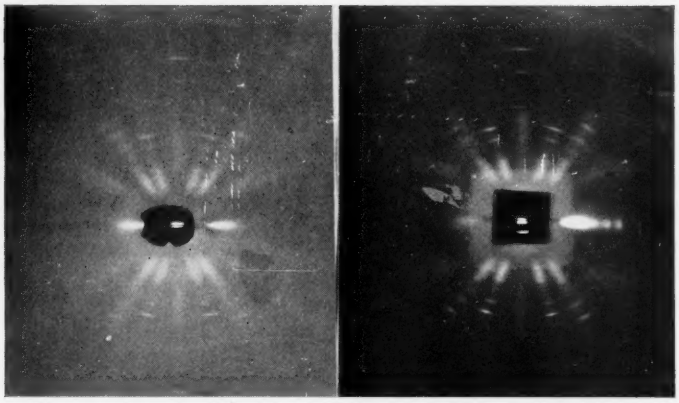
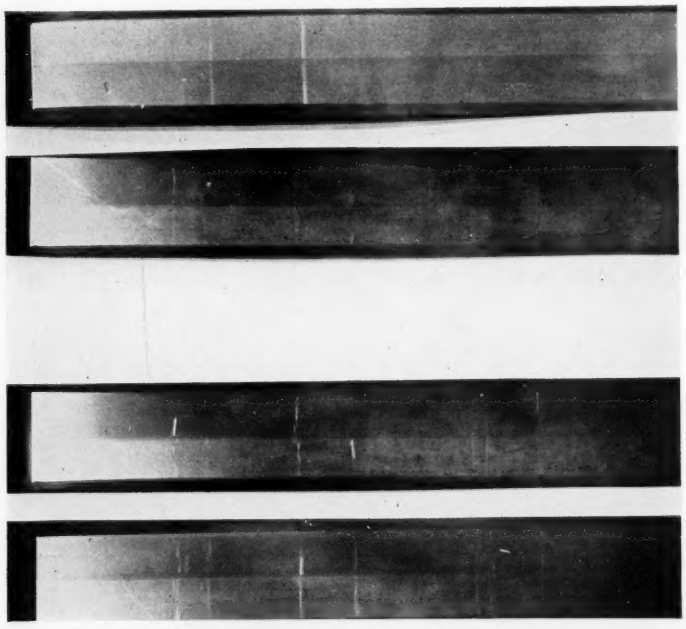


Fig. 5.

a. Rotation Spectrum of Core. b. Oscillation Spectrum.



G-11

G-10

G-12

Fig. 6. 10. No. 6 B. and S. Annealed Copper Wire.
11. No. 6 B. and S. Annealed Copper Wire, Etched to 0.5 mm. Diameter.
12. Same as 11, Rotated 90°.

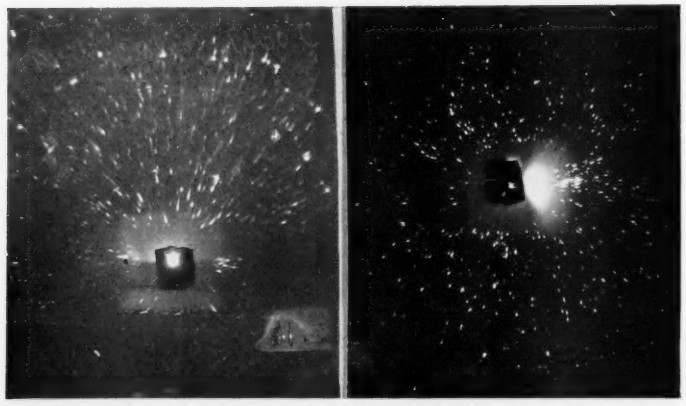


Fig. 7—a. Spectrum of Surface of H. D. Wire Annealed above 1050°C. ✦ b. Spectrum of Core of H. D. Wire Annealed above 1050°C. ✦ ✦

AFTER the density of the original wires had been measured, by weighing in water and in air, their cross-sectional areas were determined. The area was then calculated from the volume thus determined and the length of the wire. These areas were checked by measuring the diameters both with a micrometer caliper and with a micrometer microscope under a magnification of 70 diameters, and were found to agree within the necessary limits of accuracy. For the intermediate samples, where differential etching might occur along the length of the wires, the micrometer measurements were carefully checked. As an added precaution, after the last potentiometric measurement was made the wire was cut under the knife edges, and the cross-sectional area of that part of the wire actually measured was again determined by all three methods mentioned above. The results so obtained were all in agreement.

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TABLE II summarizes the results of these measurements for the wires chosen as representative. Fig. 8 is a graphical representation of these results plotted logarithmically so as to represent more closely the cumulative nature of the changes in the resistivity observed.

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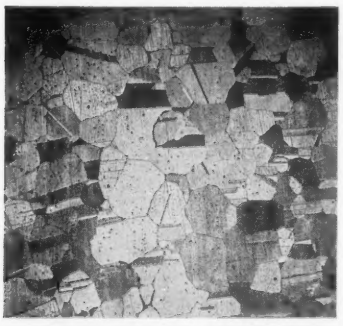
THE resistivity in the skin in hard-drawn wires was found to be higher than in the wires after the first etching. More correctly stated, the average resistivities of the original wires were higher than the average resistivities for the wires after the outer surfaces had been dissolved off. However,



c. Micrograph of Core of H. D. Wire Annealed above 1050°C. (100-X). ✦ ✦ ✦

for the hard-drawn wires the curves representing these average resistivities changed abruptly in slope after the first etching, and upon subsequent etchings rose to a maximum value as the longitudinal axes of the wires were approached. For finer wires, where it was thought that the small current flow might have had some heating effect which would increase the resistivity, the probable rise in temperature occurring in the wire (assuming no radiation) was calculated for the time necessary to make an observation. It was found that the increase in temperature would be negligible for the currents used. However, to check the specific resistivity in these finer wires, various current strengths were used and the drop in potential in the wire was determined for each. The results shown in the foregoing curves were obtained by using currents of sufficiently low strength that the heating effect manifested was negligible.

Part Three of This Article Will Appear in the June Issue of WIRE & WIRE PRODUCTS. Subject, "Resistance to Deformation Correlated with Cell Orientation and Other Concepts".

TABLE II—Change in Specific Resistivity With Cross-Sectional Area

Wire B. & S. Gauge	Area at Section (Sq. cm.)	Specific Resistivity (Microhms cu.cm.)
No. 12 H. D.	0.0333	1.764
	0.0314	1.762
	0.00255	1.808
	0.00149	1.819
	0.00129	1.914
No. 6 H. D.	0.1350	1.762
	0.1323	1.738
	0.0782	7.781
	0.0349	1.775
	0.0151	1.789
	0.0052	1.797
	0.00172	1.841
No. 6 Annealed	0.1350	1.728
	0.1320	1.721
	0.0775	1.726
	0.0378	1.712
	0.0172	1.736
	0.00371	1.727
	0.00135	1.729
No. 10 H. D. (from native Cu)	0.0557	1.729
	0.0529	1.698
	0.0137	1.745
	0.00288	1.793
	0.00135	1.840
No. 10 H. D. (Same as No. 10 above—annealed)	0.0555	1.683
	0.0132	1.628
	0.00295	1.682
	0.00141	1.725

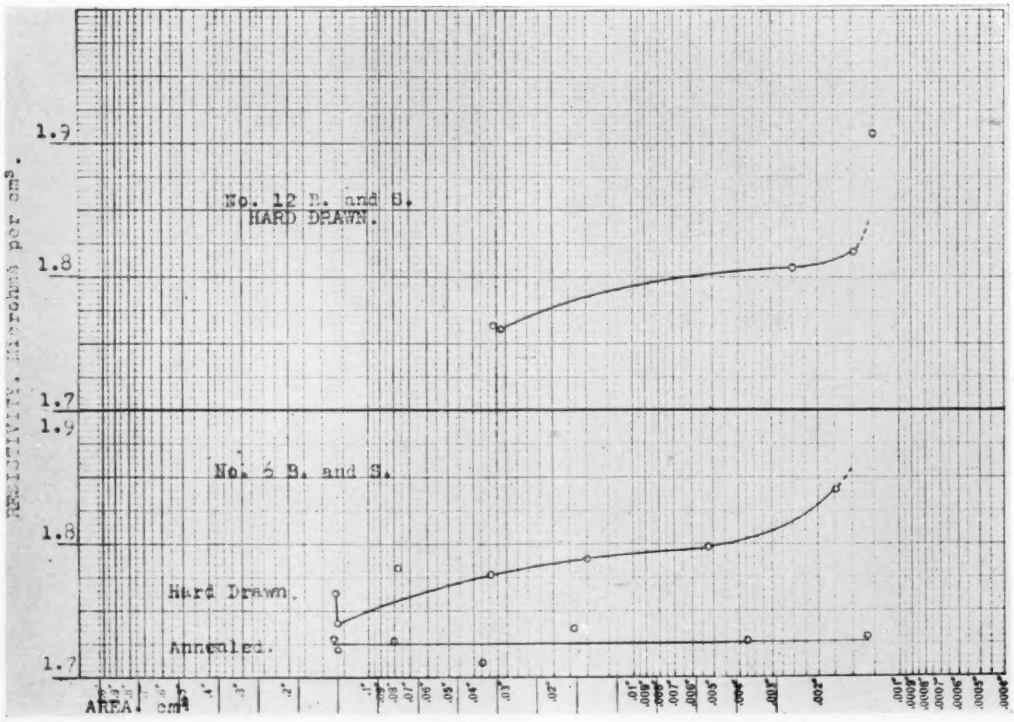


Fig. 8—Curves Correlating Resistivity Changes with Changes in Cross-Sectional Area of Hard-Drawn Copper Wire.

The Story of Wire

PART IV

By Captain Frank W. Bullock
Signal Corps, U. S. Army

A survey of the origin and development of the wire industry, together with an analysis of the conditions creating wire products markets and a ten-year forecast on the future of the wire industry. An original research prepared for the Harvard Graduate School of Business Administration. ✦ ✦

The Future of the Wire Industry a Ten Year Forecast

THE term "forecast" applied to what follows seems an unwarranted attempt to dignify conclusions which are partly impressions gained from personal observation which suffer from the limitations of the military point of view, and partly pure speculation. Although everyone is familiar with the variety of articles in everyday use which are fabricated wholly or in part of wire, what many of us do not realize is that the wire used for these articles represents but a comparatively insignificant proportion of the total production of the wire industry. Wire is primarily a contributory product required by other forms of productive industry. The activity of general business, then, determines the production requirements of the wire industry.

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IN a period of depression, following a period of widespread over-extension of industry, defensive retrenchment always falls heaviest upon plant maintenance and replacement of equipment. The present situation has been no exception to the rule. Even a moderate business revival will find many manufacturers with obsolete plants which must be rehabilitated. Admitting that public pressure is being exerted to prevent the creation of new productive facilities, the rehabilitation of existing plants will mean fair business for the wire industry for at least ten years to come.

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THAT does not mean that the outlook for the wire makers of America is rosy—in fact it is the reverse. The recent hearings (1934) relative to the adoption of codes of fair competition for the wire industry under the National Recovery Administration disclosed the fact that among the 150 mills represented in these conferences, 81 showed operations approximately 58 per cent below normal capacity, and 30 were shut down either wholly or in part. The mills hardest hit were the mills producing large tonnage products, particularly mills producing plain copper and bronze wires for power transmission service. Specialty mills fared best, in fact, some have been more than prosperous during the bad years.

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General Market Trend

THE situation in general amounts to this: We can expect no expansion in agriculture in the immediate future, neither can we look for a revival of building activity on anything approximating the 1926-28 scale. We may anticipate a contraction of railway mileage rather than an extension, and with public utility securities somewhat in disrepute since the Insull debacle, any immediate resumption of public utility construction cannot be expected. It appears, therefore, that for the next ten years, if we assume no revolutionary change in general business organization, the markets for the large tonnage type of wire products are gone—perhaps never to return.

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ON the other hand, it has been shown that the shrinkage of the market for low cost—large bulk wire products has been in a measure offset by a shift in demand toward highly specialized wire products. This shift is much more pronounced than the few available figures shown would indicate. For example, at the N R A hearings referred to above, only 150 wire makers presented their case; at the same time 568 fabricating firms sought code provisions favorable to them. In the wire industry new products do not create new markets—new uses for wire create new markets—new markets bring forth new products.

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THIS peculiarity in the relation of technique to market in the wire industry may prove the salvation of the industry during the next decade. Granting for the moment that this country is not going to need much barbed wire, or telephone or telegraph cable, or wire rope, does that mean that wire mills serving that market must go out of business? By no means. The same machines which can draw low carbon fence wire, can, with relatively simple changes in dies and speeds, efficiently produce cold drawn shapes. A closing machine for wire rope, can, with very minor changes, strand bronze or copper antenna cable. Already, heavy drawing machines have been modified so that steel shafting up to 3″ diameter is being successfully cold drawn direct from the billet. In other words mass producers must become specialists if they hope to survive. The old days of million-ton orders will in all probability never return.

Plant Capacity in the Wire Industry

FROM these remarks one may be led to the conclusion that a serious excess in plant capacity exists in the wire industry. It is true that normal commercial requirements can be satisfied by considerably less than maximum capacity operation in the wire industry. But that does not mean an excess of capacity; it does mean that we have **reserve** capacity which should and must be maintained to meet the always unexpected requirements of war. During the late war not merely thousands but millions of tons of American barbed wire rusted in the mud from the North Sea to the Adriatic from the Black Sea to the the Baltic. The great North Sea mine barrage extending from Kirkwall to the coast of Norway absorbed thousands of tons of American wire rope. The American Expeditionary Forces, left behind them in France over 100,000 miles of permanent telephone and telegraph lines serving over 3000 stations from Bordeaux to the Rhine. American combat divisions left over 200,000 miles of field telephone wire in the wake of their advance from Chateau Thierry to the Vesle, to Soissons, to St. Mihiel and finally to Sedan. Considering these huge war expenditures it is significant to note that while American rolling mills supplied the world with wire rods, and our large wire mills turned out barbed wire and rope in enormous quantities, when it came to specialized products such as field telephone wire, the wire mills of this country fell far short of ever catching up with requirements. Indeed, in October 1918, the best efforts of wire mills in this country only delivered 8000 miles of combat wire—in the same month our troops consumed 65,000 miles. Excess capacity? Hardly!

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Emergency Capacity Inadequate For Finished Products

A TABULATION by items of the estimated direct wire requirements of the Army and Navy for a theoretical maximum military effort of a defensive character—not including barbed wire, the requirements for which cannot be estimated since they depend on unknown terrain and peculiar tactical conditions—show estimates which total less than 20,000 tons gross per year and represent only about 14% of the total war requirements for these special and semi-special products. In tonnage the estimated emergency requirements could be satisfied with about six weeks running time by two large Eastern mills. In terms of finished products, our present reserve capacity would overtake requirements not less than twenty months after the opening of hostilities. To supply the armed services with their full requirements in wire will not necessarily insure the success of our arms, but the failure to meet those requirements might accomplish our defeat.

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Productive Resources

HAVING very roughly hinted at our requirements for wire and wire products in the predictable future, let us turn for a moment and survey our productive resources. Again we find that anything approaching a complete statistical picture of plant facilities is lacking. There is no standard nomenclature or classification of machines used in all branches of the wire industry. Similar machines perform widely different operations in different localities and have different capacities under differing conditions.

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WIRE mills, however, are of relatively simple structure, requiring only moderate capital investment, they may be moved from one location to another with relatively small cost and delay. As a result of this characteristic wire mills have always tended to follow their markets rather than concentrate near their sources of supply of raw materials. Their products, being relatively valuable for their bulk, are able to absorb widely varying transportation costs. Production of highly specialized products has tended to concentrate in the industrial East, while producers of common products have drifted to the eastern border of the agricultural West. Exhibit 9, Table 1, furnishes a very incomplete picture of the location and distribution of the larger wire mills in this country. It does not include any of the "integrated" mills which appear as part of the steel or copper plants with which they are associated. It does furnish a representative summary of the general distribution of wire producing facilities.

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Exhibit 9, Table 2, is an incomplete summary of wire machinery installed. It omits a great many of the types of standard and special machines found in every wire mill but again it may be called representative. Wire mill executives, in the main, retain their traditional secretive attitude in the matter of reporting plant equipment—or anything else.

✦ ✦ ✦

Statistical Information Unreliable

CENSUS figures are quite unreliable and the chief difficulty confronting the Wire Association in conducting its survey was the unwillingness of plant executives to "come clean" with regard to plant equipment and capacity. There is no doubt, however, that physically the wire industry is equipped to satisfy fully all domestic requirements both 'normal' and 'emergency' for at least the next ten years provided no important new uses for wire develop.

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Possible Future Production Problems

ANY inadequacy in productive capacity either for peace or war will appear in the field of contributory requirements. Of these, strategic raw materials and labor constitute the only real problems. Strategic raw materials involved in meeting normal and emergency wire requirements are tin, nickel, chromium, antimony and rubber. Of these, tin and rubber are the only materials for which no acceptable substitutes have been discov-

ered. But even in these materials there is opportunity to effect important economies in their use without detriment to the product in ordinary service. For the exacting service demanded of military equipment there could be little saving in the use of strategic raw materials but rigid conservation in ordinary requirements would go a long way toward securing the supplies "essential to wartime needs". [1]

✦ ✦ ✦

LABOR constitutes an ever present problem in the wire industry, one which becomes acute in even a minor emergency. Wire making requires the highest degree of skill in the entire list of metal trades. In spite of this fact, wire work is frequently disagreeable and, compared with other metal trades, is poorly paid. Young Americans seldom aspire to become wire drawers and new workers must for the most part be imported. Fortunately the best wire workers come from those countries which are the least affected by our immigration laws. It would almost seem that skill in wire working is a racial, rather than an acquired qualification. Just as it takes a Scotchman to be a good marine engineer so does it take a Swede to make a good wire drawer.

✦ ✦ ✦

Labor

AS a result of this peculiarity, wire workers as a group have grown steadily older ever since the late war, and the available supply has decreased steadily. Even a moderate revival of business will bring a shortage in skilled wire workers. True, the group would suffer little from selective service in the event of war but without a very material increase in the present supply of skilled labor the wire industry would be hard put to carry out its wartime mission. Moreover it is labor and labor alone which makes location a strategic factor. A wire mill need not be housed in an elaborate building machinery is neither bulky nor hard to install, shop transportation and handling facilities are neither elaborate nor particularly costly. housed in an elaborate building, and quickly transplanted to meet a particular strategic situation. Labor, however, cannot be readily persuaded to move, and new labor is hard to recruit, harder to train and usually unsatisfactory when trained.

[1] Sec. 5D, National Defense Act.

Exhibit—9. Table 1.

Summary of the Wire Industry in the United States; By States as of 1927

State	No. of Establishments Reporting	Value of Products	Relative Rank	
U. S.	73	$190,709,790	100.	1
New Jersey	10	39,156,228	20.5	1
Illinois	11	38,011,648	19.9	2
New York	6	27,883,539	14.7	3
Massachusetts	15	22,881,881	12.0	4
Pennsylvania	11	15,787,174	8.3	5
Ohio	6	11,329,664	6.0	6
Connecticut	5	7,289,823	3.8	7
All Others (1)	9	28,369,833	14.8	—

(1) "All Others" includes: Indiana, 2 establishments; Michigan, 1; Missouri, 1; Rhode Island, 2; and Wisconsin, 3.

Data extracted from Census of Manufactures for 1927, Page 48, Table 9, limited to Wire Drawing proper.

Exhibit—9. Table 2.

Summary of Common Wire Mill Equipment in the United States 1925 and 1927

Type	1925	1927	Per Cent Change
Wire Drawing Blocks:			
Rod Blocks	12,278	11,839	— 3.6
Redrawing blocks	11,451	11,387	— 0.6
Fine wire blocks (2)	33,709	24,597	—27.0
Total drawing blocks	57,438	47,823	—16.7
Annual Capacity (tons)	5,087,307	5,173,848	1.7
Wire Nail Machines:			
Total Number	6,277	6,137	— 2.2
Annual Cap. (kegs, 100lb)	25,762,250	25,947,973	0.7
Barbed Wire Machines:			
Total Machines	1,463	1,408	— 3.8
Annual Capacity (tons)	751,400	723,400	— 3.7
Woven Wire Fence Machines:			
Total Machines	485	480	— 1.0
Annual Capacity (tons)	793,101	822,844	3.8
Fine Wire Netting Machines:			
Total Machines	200	224	12.0
Annual Capacity (tons)	45,488	55,578	22.2
Cold Rolling Machines:			
Number of Stands	904	1,003	11.0
Annual Capacity (tons)	193,795	224,154	15.7
Stranding, Forming and Closing Machines, extruders automatic spring machines etc. (1)			

(1) Figures not available from published sources, existing figures confidential. Machines of this type constitute strategic "bottle neck".

Data extracted from Census of Manufacturers for 1927, page 47, Table 7.
(2) Sizes below 20 ga. B. & S.

Summary

IT would seem that this discussion has wandered somewhat far afield from what has been styled a ten year forecast of the wire industry. But the apparent lack of cohesion has had a definite purpose. Realizing that it is impos-

(*Please turn to page 201*)

Diamond Dies

A history of the development of the diamond die together with an outline of methods of manufacture as compiled by the Association of Wire, Rod & Tube Die Manufacturers, Inc. Part I.

MUCH has been said for and against the diamond die. However, there has been very little written comment on the subject and no authoritative data prepared. This is, undoubtedly, due to the origin of manufacture and the fact that until lately the making of diamond dies was considered by the makers and users, so skilled an industry that only the elect were privileged to know anything concerning the work.

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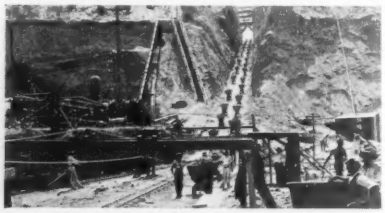
THE diamond die division of the Association of Wire, Rod and Tube Die Mfgrs., Inc., is of the opinion that if the die user has a greater knowledge of the elements entering into the manufacture of a diamond die, he will be able to gain better service from his dies,



Diamond Mining. Courtesy Vianney Wire Die Works. ✦ ✦ ✦ ✦

select them with more care and thereby contribute much to the stability of an industry organized solely to cater to his wants. This paper was prepared by all the members of this division of the die industry and reflects the best thought of the group. Because it represents the consensus of a group, rather than the claims of any one manufacturer, only those items of proven worth are set forth.

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BEFORE taking up the diamond die, it would seem reasonable to review quickly the history of wire making and that part of its history when diamond dies first came to be used.

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History of Diamond Dies

WIRE has been made for more than 3600 years. Cold drawn wire as we understand it, was made first about 1260 A. D. To us drawn wire and dies seem so commonplace that it is difficult to realize that they were once innovations. Indeed they were revolutionary in their effect on the history of industry and commercial development. The fact that their discovery is not set down in histories as one of the great dates of record probably means that their coming was evolutionary rather than the result of the independent search of one man or group.

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THE early wire drawing die seems to have had only one outstanding characteristic; it was harder than the material drawn through it. This appears a logical assumption since the character of the materials drawn did not vary greatly, and speeds of drawing were limited to hand pulling.

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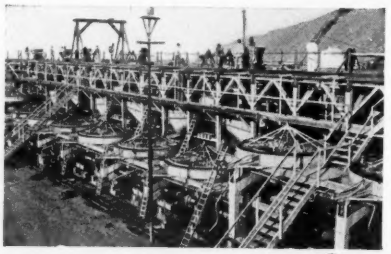
AS man is inherently lazy, the easier the pull the more popular the die. A wire drawer who had spent the greater part of a day pulling less than a hundred feet of wire undoubtedly looked forward to the time when he could knock off that job and make a die. To him "short" die life may have been a goal. However, since tolerances were not as exacting as they now are, it is conceivable that a wire drawer might pull wire for a week and spend a day preparing for his next tugging fest by making himself a die or two. Only with the introduction of water and steam power in wire drawing did the problem of longer die life manifest itself. Until that time, rate of wear in dies and die replacement did not seriously affect the overall efficiency of the operation. The five wire mills in the United States in the year 1821 produced only about 250 tons of wire. It can be readily appreciated that the die problem while important, may not have been a factor in retarding



Diamond Mining. Courtesy Vianney Wire Die Works. ✦ ✦ ✦ ✦

production. As customer demand for wire increased and power became generally employed, the need for better and more durable dies became pressing. Chilled iron and steel in innumerable varying grades were produced and were claimed to be the last word in die plates. In fact, many of them did render remarkable service.

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DIES using a harder and more wear resisting drawing element than chilled iron or steel alloys are known to have been used in Southern and Eastern Europe early in the 19th Century by those

manufacturers engaged in the making of gold wire for braids, tapestries and other woven products. Records are available which show that sapphires, rubies and diamonds with holes in them were used sparingly by the more progressive manufacturers of gold wire at that time. The early English manufacturers of card wire did not have the advantage of diamond dies. Their use in this class of work is of more recent origin.

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Die Designs Affected By Electric Wire Sizes

IT remained for electricity, because of its need for unbroken miles of close tolerance fine wire, to demand dies which would make that wire. Most wire manufacturers shied away from diamond dies. They seemed desperate in their desire to use any substitute for a diamond, rather than the diamond itself. They tried rubies and sapphires with some success; they tried glass and quartz with less. But, as speeds of drawing increased and as the economy of speed was demonstrated, the wire mill operator, with his eye on ultimate costs, seized upon the diamond die as the only die which would enable him to get maximum speeds, uninterrupted because of excessive die wear.

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High Speeds Controlled By Die Efficiency

HIGH speed machines in wire drawing were and still are only as good as the dies employed. The efficiency of a high speed wire machine is "shot to pieces" if the dies give trouble or wear too rapidly. When the wire mill operator of the late seventies, espoused the cause of the diamond die he was exercising what would today be termed, "modern business judgement." For more than fifty years the diamond die held its place supremely. It was not until the Carbide die was introduced in early 1928 that its field was encroached upon. It may sound paradoxical, but it is a fact that since the advent of the Carbide die the field for Diamond dies has actually been widened. This was brought about by the fact, that new alloys which never were considered as lending themselves to drawing, are in their larger sizes drawn successfully through the carbide dies and in their finer sizes, through diamonds.

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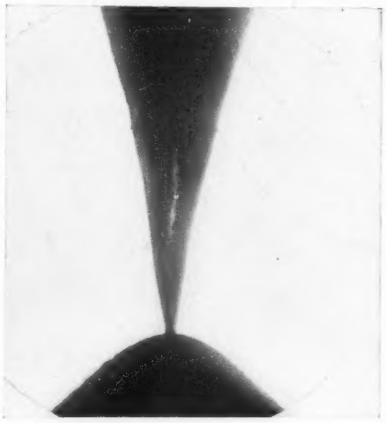
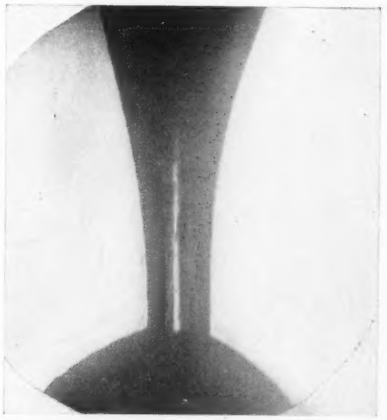
Diamond Dies For Copper Wire

IN the copper wire industry, prior to the use of carbide dies, it was the usual practice to draw copper wire as large as .093″ through diamond dies. Today it is rare to find anyone drawing copper in sizes larger than .064″ through diamond dies. When the diamond die makers began to feel the pressure of the carbide dies they were temporarily a little dismayed, but the knowledge of their product and the fact that the materials employed are still the ultimate in wear resistance and hardness re-assured them. Some of them, who could make workable arrangements with the owners of the patents covering carbide dies, made such arrangements and today they produce both the carbide and the diamond die. The fact that this is so, clearly indicates that each of these dies has a separate and distinct field of proficiency and that each plays a real part in the economic set up.



A. Cross section of a new diamond die with a .0006-inch diameter, magnified 100 times. (Westinghouse Lamp Co., Bloomfield, N. J.) ✦



B. Cross section of a recut diamond die magnified 100 times. Present diameter of opening is .004 inches, was formerly .001 inches. (Westinghouse Lamp Co., Bloomfield, N. J.) ✦ ✦

✦ ✦ ✦

Diamond Dies For Resistance Wire, Filaments, Etc.

IN the field of resistance wire, very fine wire filaments, precision electrical equipment and the like, no die has yet successfully substituted for a diamond die. No one has ever succeeded, on a commercial basis, in making carbide dies smaller in diameter than .004″, while, on the other hand, it is not unusual for diamond dies to be made and used at sizes only one tenth that diameter, .0004″. Today, this field for diamond dies is constantly growing.

✦ ✦ ✦

Diamond Dies In the Steel Wire Industry

THE steel industry has never embraced the diamond die except for very special classes of work. They were used and still are used very extensively, in the drawing of card wire, music wire, weaving wire, and other expensive fine wires where the failure of the die through rapid wear will cause the loss of a costly product.

✦ ✦ ✦

Process of Manufacture of Diamond Dies

DIAMOND die manufacture is a simple process. It consists of taking a diamond, setting it in a support, drilling and shaping a hole in it. Some manufacturers prefer to drill the diamond before setting it. There is, in fact, no more to the process than that. However, lest some reader conclude that he will begin the manufacture of diamond dies for his own use, thinking the job is a simple process, it

(*Please turn to page 202*)

A Review of Recent Wire Patents

No. 1,993,162, MACHINE FOR FORMING OFFSETS IN SPRINGS, Patented March 5, 1935, by Philip Gritz, Detroit, Mich., assignor to L. A. Young Spring and Wire Corporation, Detroit, Michigan.

This device is adapted for association directly with the spring coiling and knotting machine and forms offsets in the spring as part of the continuous operation.

✦ ✦ ✦

No. 1,993,188, SPRING STRUCTURE, Patented March 5, 1935, by George A. Stackhouse, Oakland, Calif., assignor to L. A. Young Spring and Wire Corporation, Detroit, Mich.

In this spring structure, the individual coils are free to work independently, the terminal coils being connected by helical wire tie members.

✦ ✦ ✦

No. 1,993,189, SPRING ASSEMBLING APPARATUS, Patented March 5, 1935, by George A. Stackhouse, Oakland, Calif, assignor to L. A. Young Spring and Wire Corporation, Detroit, Michigan.

This machine is adapted for manufacturing the wire spring structure thus described.

✦ ✦ ✦

No. 1,993,190, SPRING ASSEMBLING APPLIANCE, Patented March 5, 1935, by George A. Stackhouse, Oakland, Calif., assignor to L. A. Young Spring and Wire Corporation, Detroit, Michigan.

More particularly, this is an attachment for spring assembling machines and is adapted for rotating the helical wire tie members, particularly in assembling them in the body springs.

✦ ✦ ✦

No. 1,993,402, METHOD OF MAKING NAILS, Patented March 5, 1935, by Robert J. Farrell, Waynesburg, Pa.

This method is provided for the manufacture of wire nails having a cupped driving end and a mechanically roughened surface.

✦ ✦ ✦

No. 1,993,424, CABLE, Patented March 5, 1935, by Howard H. Weber, Rome, N. Y., assignor to General Cable Corporation, New York, N. Y., a corporation of New Jersey.

More specifically, the invention lies in the provision of a service cable in which a putty is employed, the putty preferably comprising a fatty acid pitch (such as stearin pitch) and a mineral filler (such as short fiber silicate of magnesia).

✦ ✦ ✦

No. 1,993,526, SUBMARINE COMMUNICATION CABLE, Patented March 5, 1935, by Wilhelm Rihl, Berlin-Eichkamp, Germany, assignor to Siemens & Halske, Aktiengesellschaft, Siemensstadt, near Berlin, Germany, a corporation of Germany.

In this cable, the conductors are of sector-shape and are combined to form a conductor of circular cross-section in the finished cable. It is claimed that with this construction, the weight of the cable is reduced considerably.

Complete Descriptions and Drawings of Patents May Be Had for 25 cents. Address, Wire & Wire Products, 17 East 42nd St., New York.

No. 1,993,755, WIRE TYING MACHINE, Patented March 12, 1935, by Ivan H. Spoor, La Grange, Ill., assignor to The Gerrard Company, Inc., Chicago, Ill., a corporation of Delaware.

Specifically, the invention lies in the provision of a tensioning mechanism associated with a wire tying machine.

✦ ✦ ✦

No. 1,993,838, ELECTRICAL INSULATION, Patented March 12, 1935, by Max Hagedorn, Dessau in Anhalt, Germany, assignor to I. G. Farbenindustrie Aktiengesellschaft, Frankfort-on-the-Main, Germany, a corporation of Germany.

It is claimed that this insulation is particularly applicable for use about wire conductors, and comprises cellulose stearate or cellulose laurate either in sheet or as impregnating paper.

✦ ✦ ✦

No. 1,993,936, ART OF FOURDRINIER WIRE ROLLING, Patented March 12, 1935, by Malcolm J. Mackay, Kalamazoo, Michigan, and John D. Watson, Appleton, Wisconsin.

It is stated that by the use of this machine the "knuckles" on the wire making up the wire cloth will be forced into the same plane or flattened so that the wire cloth will have a smooth surface where the wires cross.

✦ ✦ ✦

No. 1,994,043, UPHOLSTERY SPRING INSERTING MACHINE, Patented March 12, 1935, by Charles Lofman, Riverside, Ill., and Karl Kaiser, Michigan City, Ind., assignors to S. Karpen & Bros., Chicago, Ill., a corporation of Illinois.

More particularly, the invention embodies a means for holding a pocket of fabric in an open position so that an upholstery spring may be inserted therein.

✦ ✦ ✦

No. 1,994,187, METHOD AND APPARATUS FOR PRODUCING WIRE, Patented March 12, 1935, by Earl T. Bennington, Huntsburg, Ohio.

In connection with a rod mill, the inventor provides a drawing apparatus comprising several series of disks arranged in alignment and having the peripheral edges thereof grooved and disposed adjacent each other, means for rotating the disks of each series at different speeds, means for feeding the wire from the rod mill between the first series of disks including a tubular guide and a tension device and means operated by the passage of the wire through the tubular guide for controlling the operation of the tension device.

✦ ✦ ✦

No. 1,994,254, ARMATURE WINDING MACHINE, Patented March 12, 1935, by Robert L. Probst, Clayton, Mo.

Grippers are provided for placing the wires in the proper grooves in the armature automatically as an incident to rotation of the grippers and the armature.

No. 1,994,661, WINDING MACHINE, Patented March 19, 1935, by Robert Pash, Cranford, N. J., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

Specifically, this is a machine for winding toroidal coils used particularly for loading telephone circuits.

✦ ✦ ✦

No. 1,994,684, FORMATION OF WIRE COILS, Patented March 12, 1935, by Kenly C. Bugg, Farmington, Mo., assignor to Hoosier Lamp & Stamping Corporation, Evansville, Ind., a corporation of Indiana.

For the purpose of eliminating the ordinary spool associated with coiled wire used, for instance, in the electrical industry, this inventor provides a collapsible spool upon which the wire is wound and the spool then removed, a number of folded-over strips of flexible material, such as heavy paper or cardboard, being provided to take the place of the spool, the flexible material being held in place by wire turns in the body of the coil.

✦ ✦ ✦

No. 1,994,802, WIRE ENAMELING, Patented March 12, 1935, by Arthur H. Adams, Yonkers, N. Y.

In this wire enameling machine, a stripe of enamel is deposited upon the wire and the stripe then spiralled about the wire. It is claimed that with this arrangement, considerable enamel is saved.

✦ ✦ ✦

No. 1,995,227, COIL WINDING MACHINE, Patented March 19, 1935, by Alvah Rittenhouse, Philadelphia, Pa., assignor to Philadelphia Storage Battery Company, Philadelphia, Pa., a corporation of Pennsylvania.

This is a radio coil-winding apparatus and includes the conventional rotating bobbin or mandrel together with a cylindrical cam member so arranged in connection with the bobbin that the wire strand is guided at high speed by the cam member and a reverse bend of the strand is produced and is laid on the bobbin tightly without kinking or whipping.

✦ ✦ ✦

No. 1,995,356, SUBMARINE COMMUNICATION CONDUCTOR, Patented March 26, 1935, by Victor E. Legg, East Orange, N. J., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York.

The structure includes a wire conductor of the "reentrant type" having its void spaces filled with an impregnating material of the class including Chatteron's compound, and melted rubber so as to completely fill the voids between and about the strands.

✦ ✦ ✦

No. 1,995,705 and 1,995,706, NAILS, Patented March 26, 1935, by Albert J. Deniston, Jr., Chicago, Ill.

The inventor provides roofing nails having a conventional driving head and a sealing head below the driving head, the sealing head being of lead adapted to contact with the roofing or sheating material.

Exports and Imports of Wire

Exports of Iron and Steel Wire Products in Feb. 1935 and Feb. 1934
(In gross tons)

	Feb. 1935	Jan. 1934	Feb. 1934
Wire rods	1,681	3,279	1,190
Hoops, bands and strip steel	3,512	2,772	1,884
Plain black or galvanized iron or steel wire	1,892	3,220	3,374
Barbed wire and woven wire fencing	2,313	2,724	3,324
Woven wire screen cloth	74	100	59
Wire rope	319	231	120
Insulated iron or steel wire and cable—see analysis below			
Other wire and manufactures	306	365	313
Wire nails	548	783	966
Tacks	27	36	45
Other nails, including staples	231	239	263
Bolts, machine screws, nuts, rivets and washers	574	438	398
Total, these 11 classifications	11,477	14,187	11,936

Imports of Iron and Steel Wire Products Into The United States
(In gross tons)

Concrete reinforcement bars	....	109	229
Hollow bars and drill steel	55	50	48
Merchant steel bars	1,604	2,210	1,254
Wire rods	952	775	864
Barbed wire	2,217	1,684	347
Round iron and steel wire	224	415	147
Telephone and telegraph wire	....	....	....
Flat wire and strip steel	103	112	184
Wire rope and strand	113	193	103
Other wire	67	146	64
Hoops and bands	1,234	2,207	1,040
Nails, tacks and staples	966	993	414
Bolts, nuts and rivets	22	36	25
Total, these 13 classifications	7,557	8,930	4,719

February Exports

JAPAN maintained its role as the leading individual market for iron and steel products from the United States even though its take of 95,203 tons was considerably below the tonnage received during the previous month. The chief products moving to Japan during the month under review were iron and steel scrap, 76,830 tons, tin plate and taggers' tin, 5,290 tons, ingots, blooms, billets, slabs, and sheet bars, 5,129 tons, tin plate scrap, 2,739 tons, wire rods, 1,423 tons, waste-waste tin plate, 1,211, and steel bars, 849 tons. Italy with purchases amounting to 33,512 tons was the next market of importance, and this total was practically all made up of 33,269 tons of iron and steel scrap, and 200 tons of tin plate. The United Kingdom ranked next with a take of 23,897 tons almost wholly made up of 23,331 tons of iron and steel scrap, and 316 tons of strip hoop, band, and scroll, hot rolled. Canada was the fourth market with purchases aggregating 18,729 tons in a varied trade of which the chief products were black steel sheets, 4,114 tons, steel bars, 2,461 tons, iron and steel scrap, 2,178 tons, strip hoop, band, and scroll, hot rolled, 1,837 tons, plain shapes, 1,206 tons, strip hoop, band and scroll, cold rolled, 1,192 tons, and skelp, 1,085 tons. Mexico ranked next with a total of 10,461 tons in a varied trade, the chief items including iron and steel scrap, 5,853 tons, cast-iron pressure pipe and fittings, 577 tons, black steel sheets, 545 tons, black steel welded pipe, 492 tons, car wheels and axles, 401 tons, tin plate and taggers' tin, 386 tons, and barbed wire, 367 tons. The Philippine Islands made up the sixth market with receipts amounting to 5,935 tons including chiefly galvanized steel sheets, 2,093 tons, cast-iron pressure pipe and fittings, 1,111 tons, tin plate and taggers' tin, 521 tons, steel bars, 464 tons, plain shapes, 317 tons, and 'other plate', 224 tons.

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February Imports

PIG iron imports from the Netherlands were resumed in February after a lapse of several months, that country supplying 6,759 tons and assuming—by virtue thereof—the lead in the supply of iron and steel products to the United States during the month under review. In addition, barbed wire was purchased from that country to the extent of 86 tons. The second supplier was Germany with participation amounting to 4,937 tons which was made up chiefly of 1,833 tons of barbed wire, 1,109 tons of 'other pipe', 806 tons of nails, tacks, and staples, 292 tons of sheets, skelp, and sawplate, 188 tons of rails, and rail fastenings, and 159 tons of wire rods. Canada was the next country of supply with aggregate shipments of 4,725 tons of which scrap 2,756 tons, spielgeleisen, 934 tons, and pig iron, 892 tons, were the outstanding items. Belgium ranked fourth with a total of 3,767 tons made up principally of 1.273 tons of structural shapes, 814 tons of merchant and other steel bars, 439 tons of 'other hoops and bands,' 298 tons of barbed wire, 230 tons of sheets, skelp, and sawplate, and 217 tons of rails, and rail fastenings, in a varied trade. All of the participation of British India—the next largest supplier—was confined to 2,745 tons of pig iron, while Norway sharing to the extent of 2,080 tons followed. The chief items moving from Norway to the United States were ferro-manganese, 1,336 tons, steel ingots, blooms, etc., 387 tons, and pig iron, 345 tons.

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CARD **clothing** imports—all from the United Kingdom—amounted to 10,572 square feet valued at $14,037, and represented a decline of 5,541 square feet and $8,053.

✦ ✦ ✦

THE trade in **wire cloth and screening** gained sharply over that of the earlier month by some 68 per cent to register 67,753 square feet, and came from Germany, 49,682 square feet; Canada 8,772 square feet; France, 7,095 square feet; the Netherlands, 1,560 square feet, and Sweden, 644 square feet.

(*Please turn to page 205*)

'Round the World With the Wire Industry

German Iron and Steel Group Protection Agreement to Expire

THE so-called "Group Protection Agreement" which exists between German manufacturers of iron and steel prohibiting signatories from extending their production facilities was to have expired on March 31, 1935. It is said to be believed that the agreement will again be extended.

✦ ✦ ✦

Barbed Wire and Steel Wanted in Panama

AN agent in Panama City is interested in handling barbed wire, and steel bars. Interested subscribers may obtain further particulars by communicating with the Bureau direct or through its District or Co-operative offices and referring to Trade Opportunity No. 8547.

Chain Plant to be Erected in South Africa

AN American-Canadian chain manufacturer has decided to erect a factory in the Union of South Africa. A wide range of chains for industrial, agricultural and other purposes will be produced in this plant which will be established at Vereeniging (about 40 miles from Johannesburg), already an iron and steel producing center. Imports of "chains for hauling" only during the year ended December 31, 1933, were valued at £20,489, the principal suppliers being the United Kingdom, Canada, the United States, and Germany. It is pointed out that the establishment of this new project is significant of the growing tendency to establish secondary steel working industries in the Union now that the large Iron and Steel Industrial Corporation at Pretoria is well organized and producing.

Manganese Production From German Ores

GERMAN requirements of manganese which have so far been covered by working up high grade foreign manganese ores can henceforth be satisfied from domestic sources. It is claimed that it is possible to obtain a marketable manganese of satisfactory quality from German ores and the tests which are being carried on are reported already to have met with considerable success.

✦ ✦ ✦

New "AVI" Rates

NEW rates under the well known "AVI" agreement between the German iron producing and iron working industries have been fixed effective January 1, 1935. Reimbursement will be made according to the following table for each metric ton of iron used in the

Micrometer MICRO-WELD Precision
Trade Mark Reg. U.S. Pat. Off.

MICRO

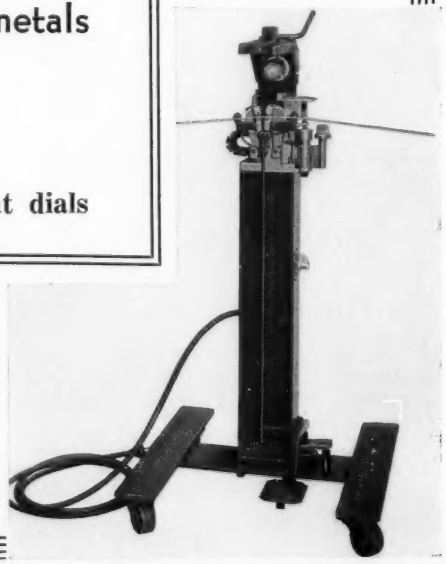
For fast, accurate and uniform welding

No. 30 to 3/4" -- WIRE and ROD -- all metals

The best known wire manufacturing and fabricating plants throughout the world continue to add new MICRO units to their equipment—convincing proof that MICRO Welders "do their stuff".

Only MICRO has patented speed-precision adjustment dials

Model "J" MICRO
Automatic Flash Welder for Round and Flat Wire and Strip Stock



We'll help you solve your welding problems . . . write us for complete details.

MICRO PRODUCTS COMPANY

20 North Wacker Drive
Phone State 7468
CHICAGO, ILL.

Factory and General Office
PEORIA, ILL.

manufacture of products for export:

Pig iron (Rohblocke)	RM 41.00
Ingots (Vorblocke)	RM 41.00
Billets (Knuppel)	RM 41.00
Bars (Platinen)	RM 41.00
Shapes (Formeisen)	RM 46.50
Hoop Iron (Bandeisen)	RM 46.00
Thick plate (Grobbleche)	RM 47.00
Medium plate (Mittelbleche)	RM 42.00
Rods (Stabeisen)	RM 47.00

✦ ✦ ✦

British Insulated Cables

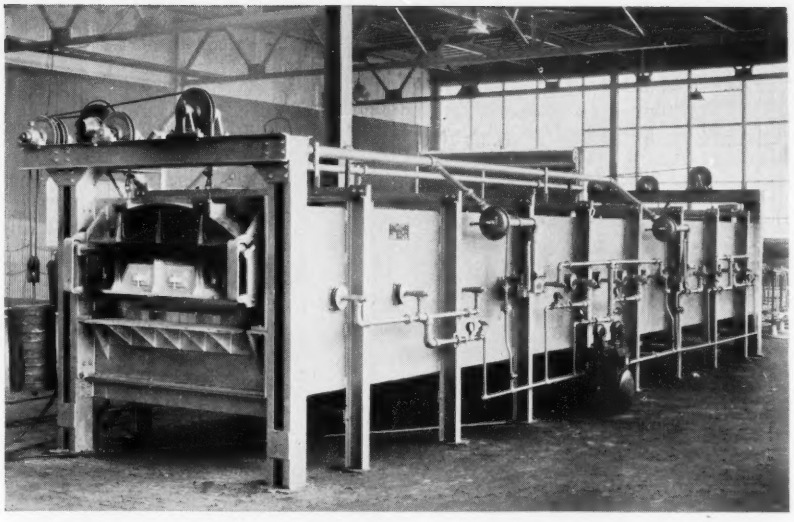
AT the annual meeting of British Insulated Cables, Ltd., the chairman, Sir Alexander Roger, stated that the quantity of copper, lead, aluminum and other metals used annually in the firm's factories exceeds 60,000 tons. The speaker pointed out, however, that whereas some years ago the company was buying its copper at £60 or more per ton it is now only paying £32. The subsidiary company, British Copper Refiners, continues to do well. British Insulated Cables is now handling nearly one-third of the total quantity of copper used in this country for electrical purposes, and the plant has been duplicated to provide against breakdowns.

✦ ✦ ✦

Effective Interest in American Wire Rods in Greece

THE ability of an American manufacturer to quote competitive prices and to effect prompt delivery, coupled with the virtual embargo placed on French exports to **Greece** in September, 1934, were responsible for the interest in wire rods imported from the United States. Normally the domestic wire industry requires 8,000 to 10,000 metric tons of wire rods annually, and in this report from John Enepekides, office of commercial attache, Athens, it is pointed out that if it were not for the quota restrictions which have afflicted American exports to Greece, the United States could doubtless secure half of this business. Under

(*Please turn to page 200*)



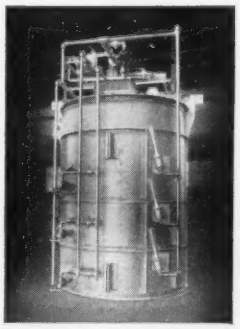
FURNACES FOR HEAT-TREATING WIRE

SC Furnaces for wire patenting, hardening, or annealing, permit increased production,—cleaner surface,—better physical properties,—dependable uniformity.

The patenting furnace illustrated above gives all these results and in addition fuel economy is obtained.

You will want to obtain all these results, no matter what your heat treating operation or problem may be. Call on Surface Combustion Engineers—they will be glad to consult with you.

The bell type, **controlled atmosphere** *annealing furnace illustrated at the right, anneals wire coils or coils of strip—clean, with uniformly high quality and with economy.*



Write for information on this or other types of SC furnaces.

Surface Combustion Corporation

SC TOLEDO, OHIO — Sales and Engineering Service in Principal Cities

Also makers of.. ATMOSPHERE FURNACES... HARDENING, DRAWING, NORMALIZING ANNEALING FURNACES... FOR CONTINUOUS OR BATCH OPERATION

'Round the World

(*Continued from page 200*)

the existing scheme, local importers have been encountering difficulties in placing their orders and arranging for payment. As effective January 1, 1935, wire rods and other iron and steel semi-manufactures specified may be imported free of individual quota allotments from countries which have exchange clearing or barter arrangements with Greece, or a balance of trade in favor of the latter, and the United States belongs in the last category; however, the Greek Ministry of National Economy has failed to specify the total amount of wire rods and other iron and steel semi-manufactures which may be imported from the United States during the first quarter of 1935, hence the difficulties noted.

✦ ✦ ✦

Canada Wire & Cable 1934 Profit

REPORT of Canada Wire & Cable Company, Ltd., and subsidiaries for year ended December 31, 1934, certified by independent auditors, shows net profit of $6,636 after expenses, depreciation, etc., equivalent to 22 cents a share on 30,000 shares of 6½% cumulative preferred stock.

✦ ✦ ✦

THIS compares with $4,398 or 14 cents a share on preferred in preceding year.

✦ ✦ ✦

Wire Workers Union at Worcester, Mass.

IT is reported that more than 200 applications for membership were received at the mass meeting of the newly organized Wire Workers Union at Worcester, Mass., held there on March 8th.

✦ ✦ ✦

F. M. Saltus and Thomas Connolly, special membership chairmen and Thomas F. Conroy of the Central Labor Union spoke on the progress of the organization work and outlined plans for vigorous unionization among the special wire workers of Worcester.

✦ ✦ ✦

Germany and Belgium Continue To Supply Uruguay

THE conditions in the Uruguayan market during the fourth quarter of 1934 did not change as regards source of supply and prices, Germany and Belgium continuing to furnish the greater part of the iron and steel imports owing to their price advantage, according to Montevideo merchants handling iron and steel and similar products.

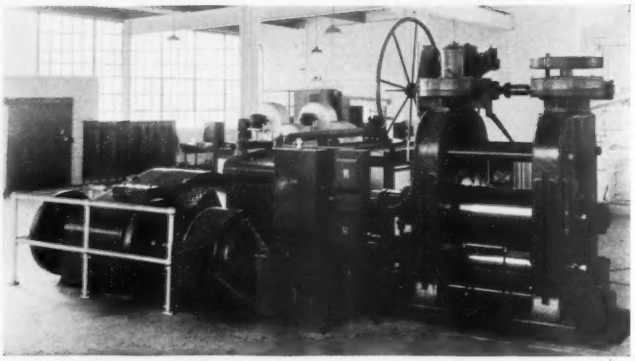
✦ ✦ ✦

Improvement Expected in International Market for Hoop Iron

A MEETING of the comptoir for hoop iron was held in Dusseldorff (Germany) at the end of February. It was reported that the situation of the international market for hoop iron could not be considered good, but an improvement is expected. At the same meeting the machine wire Cartel decided to adhere to the same price schedule and the same production

(*Please turn to page 210*)

FARREL ROLLING MILLS



for rod, strip or sheet

Farrel Rolling Mills are made in a wide range of sizes, designed for any specific purpose and constructed with the greatest care and precision.

Improved design and construction provide many advanced features which bring about more satisfactory operating conditions, increase output and lower operating and maintenance costs. . . . .

ROLLS—Forged alloy steel, hard surface chilled alloy iron or plain chilled iron.

BEARINGS—Anti-friction roller type, phenolitic, bronze or babbitt.

SCREW DOWN—Single or double motor, single or double handwheel, or wrench.

SPINDLES AND COUPLINGS—Universal type, splined or four-pod wabbler.

DRIVE—Reduction unit and pinion stand made integral or as separate units connected by flexible coupling. Sykes continuous tooth herringbone gears and pinions fully enclosed and running in oil. Anti-friction or plain bearings.

UNIT CONSTRUCTION—All units on one bedplate, or separate bed construction.

Farrel engineers will welcome the opportunity to confer with you on your rolling mill requirements and assist in the decision as to which of the alternative construction features are best suited to your individual needs.

Farrel Rolling Mill Equipment also includes: Chilled Iron and Special Alloy Iron or Steel Rolls—Universal Mill Spindles—Rod Mill Tables and Manipulating Equipment—Rod Coilers—Lead Presses for Pipe or Rod—Roll Grinding Machines—Roll Calipers—Gears and Pinions—Drives up to 10,000 H. P.

FARREL-BIRMINGHAM
Company, Inc.
38 Main St., Ansonia, Conn.

The Story of Wire

(*Continued from page 193*)

sible to present a complete statistical basis for a forecast, our samples and illustrations have been selected with a view to pointing out three definite trends which will very largely determine the course of the wire industry for the next ten years. These trends may be summarized as follows:

1. The continued decline and ultimate stabilization on a lower level of production of the so-called "mass production" wire products, accompanied by:

2. Increasing specialization, technical improvements in products and processes and a development of new uses, new markets and new products.

3. Increasing decentralization of facilities and smaller productive units, as specialization neutralizes the advantages of mere size. This decentralization will be accompanied by increasing mechanization and an increase in the productivity of workers, there being no other way to offset the steadily declining supply of skilled labor.

✦ ✦ ✦

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Wickwire Spencer Steel Co.: Wire Mill Cost Accounting

✦ ✦ ✦

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The Iron Age

Steel

The Review—American Society for Steel Treating

Bell Laboratories Record—American Telephone & Telegraph Co.

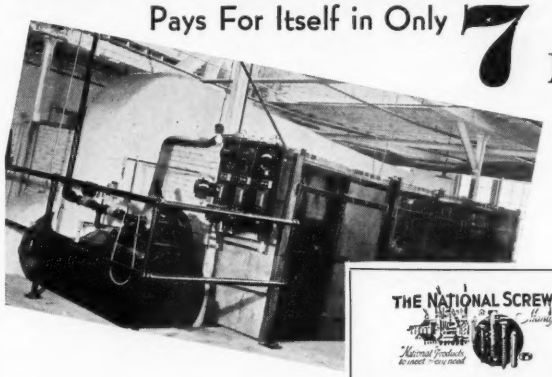
Wire and Wire Products Buyers Guide and Year Book of the Wire Association—1931-32

Manufacturers of materials, tools and equipment for wire drawing and forming plants are constantly making improvements and additions to their lines. If you do not find the product or service in which you are interested, additional information will be supplied promptly. Simply address:

WIRE & WIRE PRODUCTS
17 East 42nd Street New York City

NEW ROD BAKING METHOD

Pays For Itself in Only **7** **MONTHS** IN FUEL SAVINGS ALONE



PRODUCTION savings as high as 50% are being secured by users of Morrison Convection Heaters. The charge reaches full heat three to six times faster than with older methods, yet hourly fuel consumption is reduced. Rod is delivered in perfect condition for drawing operations. All these factors add up to surprising savings. Investigate the profit possibilities of Morrison Rod Baking Equipment.

THE NATIONAL SCREW & MANUFACTURING CO.
Makers of SCREWS, BOLTS, NUTS, RIVETS, COTTER PINS AND TACKS
CLEVELAND, OHIO

January 25, 1935

The Morrison Engineering Co , Inc.,
5005 Euclid Avenue,
Cleveland, Ohio.

Gentlemen:--

Since the installation of MORRISON convection heating equipment in our rod bakers we have not been troubled with rust or squeaky wire and the subsequent operations are very satisfactory

The savings in fuel alone have paid for this equipment in seven months This fact together with the improved condition in the bakers has made our MORRISON equipment a most satisfactory investment

At the present time our fuel costs are about eight cents per ton.

Yours very truly,
THE NATIONAL SCREW & MFG. CO.
General Superintendent.

U. S. Patent No. 1,999,513 OTHER MORRISON ENGINEERED EQUIPMENT

Convection heating equipment for Paint, Foundry, Ceramic, and Lithographing Ovens.
Tank and Process Heating up to 1400° F.

"We consider this equipment one of our best investments. The saving on this equipment is the result of taking advantage of the well known engineering fact that the most efficient way to raise the temperature of material (in the non-luminous range) is by forced convection rather than by conduction or radiation." —Metallurgical Engineer.

THE MORRISON ENGINEERING CO., Inc.

5005 EUCLID AVENUE CLEVELAND, OHIO

Diamond Dies

(*Continued from page 195*)

is perhaps better to give a more detailed account of how to make a diamond die and some record of what causes diamond die men to turn gray prematurely.

✦ ✦ ✦

TO begin with, any diamond die is an expensive tool. Yet it must be an economical one. To be economical it must draw enough first class wire to defray its cost, it must do it better and in the long run cost less than any other tool that might be substituted for it. In order to do this, a die must have a definite shape and be highly polished. It must be held to very rigid hole size tolerances. Some idea of the closeness of these tolerances may be gathered from the fact that on very fine filament wires, no hole size tolerance is stipulated. The wire, however, must pass a test of weight for a given number of meters, weighed on a torsional balance, the die being rejected if the weight of the wire is under or over .002 milligrams of the specified weight. For .0003" this would mean a tolerance of about .00003" about one hundredth of the diameter of average human hair.

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THERE is nothing occult in diamond die manufacture. However, extreme skill and rare patience are demanded of a diamond die worker. He must be of the type that can work for days, seemingly accomplishing nothing, only to learn just before completing his labors that all his work has been in vain because some defect in the drawing area of the diamond has developed. These days and in some instances weeks of work are gone forever, the diamond being good for nothing except breaking up into diamond powder. It was actually worth more before any work was put into it.

✦ ✦ ✦

THE diamond die maker must be able to drill a hole in a diamond with a needle, the point of which is sometimes so fine that a finger placed ever so lightly against it will cause the point to bend over and the needle to be rendered useless. He must learn and be able to produce dies which will draw wire on **old** worn out machines as well as dies which will perform well and draw good wire on **new** machines. He must know that even though the hole size in his die will draw one size on one type of machine on others it will draw another size. He must have the "patience of JOB" and be prepared to hear at any time and for whatever reason may be handiest, that his dies are no good. If the copper is bad, it is the dies; if the lubricant is foul and impedes drawing, the dies take the blame.

✦ ✦ ✦

Stones and Settings

IN early days of diamond die manufacture almost any diamond of the commercial type known as "Boartz" was used. Cleavages and flats were employed because they were most readily available. They cost the least, and also because the industry was young. In many instances the dia-

WIRE ASSOCIATION CONVENTION HEADQUARTERS
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Special Low Rates

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Plan NOW To Come To The Show

monds were set in lead. As the manufacturers gained experience and also as competition among them increased, each began to make better dies. Better stones were selected, some manufacturers, standardizing on round stones. The settings were no longer made of lead. Brass, bronze and other non-ferrous settings have taken their place. In some instances, manufacturers forge their diamonds in steel settings. There is merit in any setting which securely anchors and supports the diamond.

✦ ✦ ✦

Guides For Buying Diamonds

EXPERIENCE is perhaps the best guide in diamond die purchase, the experience of the buyer and the experience of the maker. A user, over a period of years, who has found satisfaction with dies of one type, who has carefully checked his production costs in terms of diamond die costs, has a definite yardstick with which to gauge claims in regard to diamond dies. Price alone is the most dangerous element of purchase in respect to a diamond die. Back of the purchase price, must be the **record of the manufacturer.** Because diamond dies are tools, which in many instances require years of use to wear out, and because it is by figures obtained throughout die life, that ultimate costs are established, the buyer of diamond dies must have **confidence** in his source of supply. In no other field of industrial purchase does the buyer have to place so much confidence in the seller as he does in the purchase of diamond dies.

Die Grinding and Polishing Machine. Courtesy Union Wire Die Co.

✦ ✦ ✦

What Constitutes A "Good" Diamond Die

MANY mills have swung from one source of diamond dies to another, the only factor involved in the change being price, to learn some two or three years later that by the change they had lost for themselves as high as fifty percent of the purchase price. This develops because the dies when recut or through use, have not proven out as well as the dies which they would have received had they continued to purchase from proven sources. This should not be taken to mean that no one should be given encouragement who enters this field. On the contrary, a new man to the field may conceivably do better than those already in it. It just means that **price alone** should not be the determining factor. Since

(*Please turn to page 204*)

TRANSPORTATION
of
MATERIALS
OVERHEAD
With
CLEVELAND TRAMRAIL
Increase Production by Reducing Idle Machine Time
Some production and processing machines can turn out finished parts faster than present methods of transportation can move these parts to their next place of need. The value of some production tools has been questioned because of this lack.
Therefore, a faster method of moving materials and semi-finished parts to and from these machines is the solution to this problem of getting full returns on the investment in processing equipment.
Cleveland Tramrail is the most complete system for the Overhead Transportation of materials and product to and through the processes. A type of carrier, hoist, grab or device to meet every Overhead Materials Transportation need.
Consult your 'phone directory under "Cleveland Tramrail."
Cleveland Tramrail Cleaning House Cranes are just one of the many units highly efficient for the Wire Industry.
CLEVELAND TRAMRAIL
Hand or Electric
Overhead Materials
Transportation Equipment
CLEVELAND TRAMRAIL
THE CLEVELAND CRANE & ENGINEERING CO.
WICKLIFFE OHIO

Diamond Dies

(*Continued from page 203*)

for raw diamonds of the same grade, the cost price is practically the same for all makers, when purchased by the diamond die manufacturer, it is not unreasonable to assume that by proper exercise of care in manufacture, that all diamond dies of about the same grade should sell for relatively the same amount. It is obvious, therefore, that dies showing a wide range in price on the low side, with claims for equal quality, should be viewed with caution. There is an old saying in the food trade that no matter what a thing costs, if it tastes bad, it is no good. The same goes for diamond dies. No matter what a diamond die sells for, unless it draws good wire in large quantity and without interruption it is too expensive. A diamond die is cheap if throughout its life it draws a large amount of good wire with a minimum of interruption, even though to begin with, it may have cost a little more.

FROM time to time mills undertake the manufacture of their own diamond dies. In the past thirty years no less than two score concerns have done so. They try it for a period and sooner or later, abandon it. It is not our purpose to discredit these attempts. In many instances the operation has been carried on economically and with great credit to the men responsible for the work. The fact that better than 90% of those starting to do so, have reverted to purchasing their dies, seems to indicate that the job is one for specialists. It is generally believed that the mill diamond die maker, being removed from the competition of other die makers, remains static in his knowledge of the improvements within the die industry. Many times it has been shown that mill methods have sometimes been obsolete for as much as five years, before the mill became aware that better dies could be had for less if purchased from outside sources.

Part II of this article will appear in the July issue of WIRE & WIRE PRODUCTS.

Premier
TRADE MARK REG. U.S PAT. OFF.
Diamond Dies

Reduce Rejects
Give Better Finish
Hold To Size Longer
Cast Straight On Block

DRIVER-HARRIS COMPANY
HARRISON · NEW JERSEY

THE NEW LINE
OF
UPRIGHT CONE WIRE DRAWING MACHINES
IS NOW COMPLETE WITH
FOUR SIZES — #0, #1, #2, #3.
FINISHING SPEEDS 2000 TO 6000 F. P. M.
MAX. START #6 B & S — MIN. FINISH #44 B & S
BLOCK OR SPOOL TYPES
SIX TO SIXTEEN DIES

Waterbury Farrel Foundry and Machine Company
Waterbury, Connecticut
OFFICES
CLEVELAND CHICAGO PHILADELPHIA

Exports and Imports

(*Continued from page 197*)

A MARKED decline of some 77 percent was recorded in the 253,925 square feet-trade of **wire fencing and netting** galvanized before weaving with the supply confined to the Netherlands, 158,300 square feet; and Belgium, 95,625 square feet. A substantial upturn was registered in galvanized after weaving receipts when the take of 609,120 square feet climbed some 280 percent over that of January, originating in Belgium, 409,120 square feet climbed some 280 percent over that of January, originating in Belgium, 409,120 square feet; and the Netherlands, 200,000 square feet.

✦ ✦ ✦

FOURDRINIER and other paper-making wire receipts at 48,875 square feet gained considerably by 41,208 square feet and came from Austria, 28,085 square feet; Germany, 13,208 square feet; and Sweden, 7,583 square feet. A decline of 696,000 pieces took place in the 1,612,000-piece trade in **wire heddles,** this total being supplied by France, 1,366,000 pieces; Germany, 208,000 pieces; and the United Kingdom, 38,000 pieces.

✦ ✦ ✦

EXPORTS of iron and steel wood screws during February, 1935 totalled 21,150 gross valued at $2,781. Of this total Cuba took 8,319 gross valued at $983; the Philippine Islands 3,210 gross valued at $421; Colombia 2,702 gross valued at $468; Canada 1,873 gross valued at $187; Mexico 1,709 gross valued at $312.

✦ ✦ ✦

EXPORTS of brass wood screws during the same period totalled 4,421 gross valued at $1,688. Of this amount Brazil took 1,410 gross valued at $436; Cuba 1,183 gross valued at $444; Panama 767 gross valued at $309; Colombia 270 gross valued at $59.

✦ ✦ ✦

IMPORTS of wood screws during the same period amounted to 45,409 gross valued at $2,724, with Japan supplying 32,400 gross valued at $1,475 and Sweden 12,945 gross valued at $1,214.

New Tack Catalog

THE **Republic Steel Corp.** has just released a new Republic Tack catalog.

This book contains 24 pages of illustrations and information covering a complete line of tacks and cut nails.

It also illustrates the new packages and cartons which have been designed to increase the ultility and saleability of these products.

Copies may be obtained from the advertising department at Massillon, Ohio, or from "WIRE & WIRE PRODUCTS".

THE CODE AUTHORITY
PUBLISHER'S STATEMENT OF CIRCULATION

This is to certify that the average circulation per issue of

WIRE & WIRE PRODUCTS

for the six months period, July 1st to and including December 31st, 1934 was as follows:

Copies sold 1899
Copies distributed free 201

Total 2100

Signed, RICHARD E. BROWN,
(Publisher)

Subscribed to and sworn before me on this 29th day of April, 1935.

CHARLOTTE FRANKL

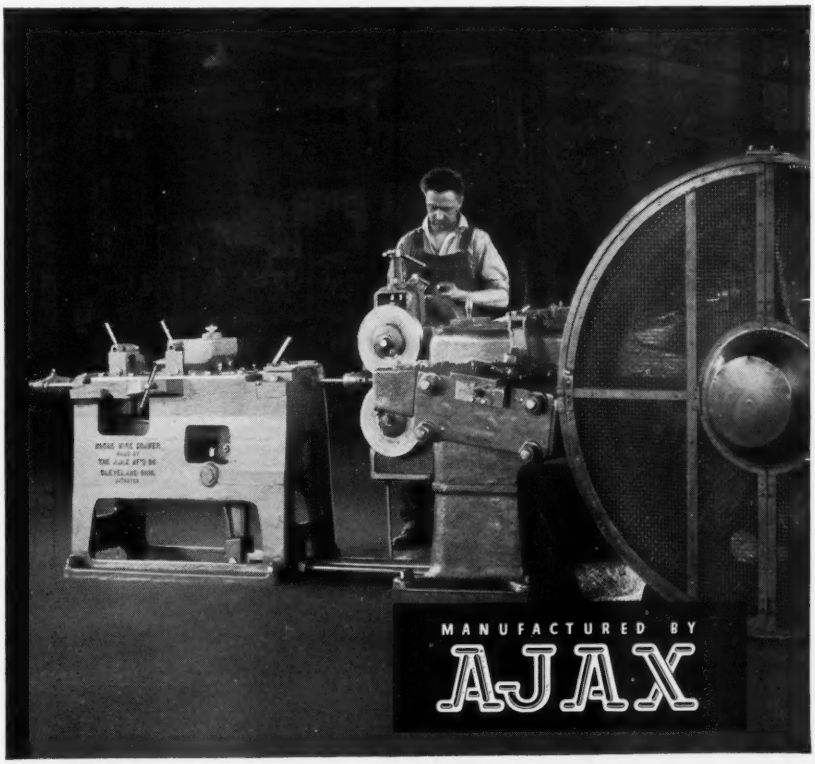
(Notary's Seal) NOTARY PUBLIC, Bronx County No. 68 Bronx County Register's No. 40F37 N. Y. Co., Clks. No. 523, Reg. No. 7FS23. Commission expires March 30, 1937.

"I'VE GOT ONE ON EVERY HEADER!

"AND IT IS MIGHTY fortunate for me that I am getting the savings in material costs and the other economies that the Ajax Hogue Wire Drawer has made possible!" So says a well-known bolt manufacturer.

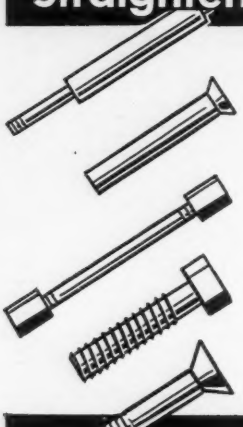
THE AJAX MANUFACTURING CO.
CLEVELAND, OHIO
Chicago Office: 621 Marquette Building

SEND FOR BULLETIN 110
It's Yours for the Asking

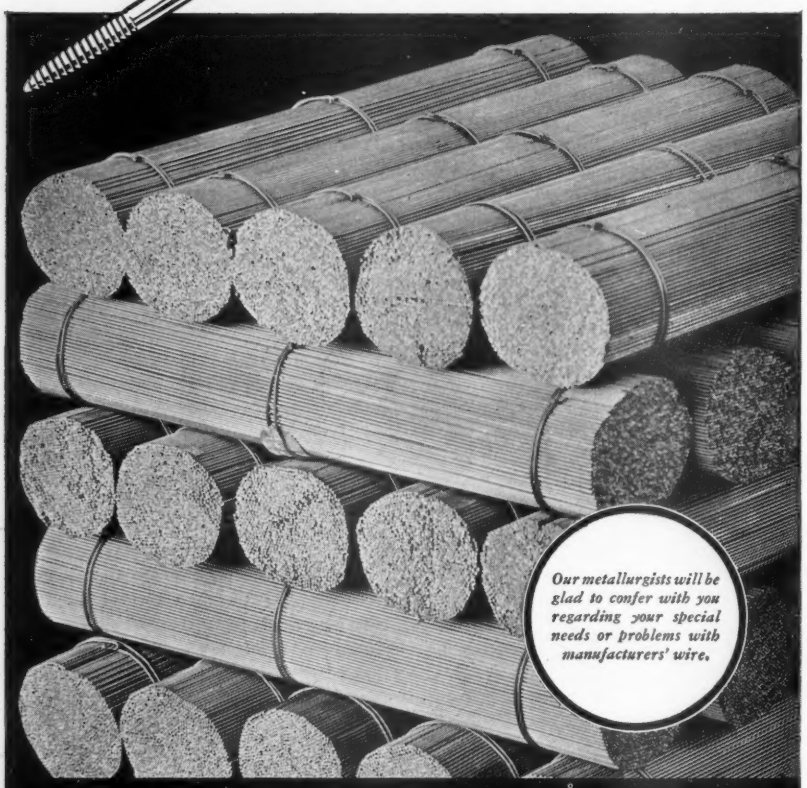


TO *Exacting*
FABRICATING REQUIREMENTS

CONTINENTAL WIRE
Straightened and Cut



● You can depend upon Continental to supply just the wire you need to simplify and expedite your production. Continental wire enables you to turn out a better product, at lower cost, with fewer "throw-outs," because it is made and processed to fit precisely the particular job . . . Continental Straightened and Cut Wire is furnished in Standard Carbon, and Copper-Bearing Steel, also "Konik" metal, in sizes to suit your needs; in Bright, Annealed, Processed or Galvanized finishes; in Round, Square, Triangular, Oval, Half Round, Half Oval, and Flat with square or round edge shapes, and in all tempers from Hard to Dead Soft.



CONTINENTAL STEEL CORPORATION
General Offices: KOKOMO, INDIANA

Manufacturers of Billets, Rods, Wire, Barbed Wire, Nails; Lawn, Chain-Link, Diamond Mesh, Farm and Poultry Fence; Gates; Black, Galvanized, Galvannealed and Special Coated Sheets; Galvanized Roofing; also "Seal of Quality" Roofing and Kindred Products.

PERSONALITIES

R. C. Pumley, Works Manager Yale & Towne, Stamford, Conn.

RICHARD G. Pumley, production manager for the Yale & Towne Mfg. Co., Stamford, Conn., has been appointed works manager, succeeding Maxwell C. Maxwell, who has been appointed special assistant to the president.

Mr. Pumley will be located at Stamford, while Mr. Maxwell will transfer his headquarters to New York.

✦ ✦ ✦

A. C. Kayser Wins General Electric Award

ARTHUR KAYSER, a tool designer at the Fort Wayne plant of the General Electric Company, was recently awarded the Charles A. Coffin award, the highest honor which the General Electric Company can bestow upon an employee.

✦ ✦ ✦

MR. Kayser has been with the company for 44 years and this is the third time he has received this award for ingenuity in designing and improving special automatic machines. The award consists of a certificate and a cash award.

✦ ✦ ✦

Dr. F. M. Walters, Jr., Appointed Metallurgist of Sheet & Tube Co.

DR. F. M. Walters, Jr., has been appointed physical metallurgist of the Youngstown Sheet & Tube Company, coming from Pittsburgh. He was formerly associate physicist of the Bureau of Standards at Washington, and director of the Metallurgical Research of Carnegie Institute of Technology, Pittsburgh, and professor at other institutions. He was last engaged as a research metallurgist of the Vanadium Alloys Steel Company.

✦ ✦ ✦

MR. Walters received the Howe medal of the American Society of Metals in 1932, and 22 of his treatises have been published or used in various text books.

MAKE YOUR PLANS NOW TO COME TO THE WIRE ASSOCIATION MEETING

PERSONALITIES

Blaw-Knox Elects A. C. Lehman, Chairman of Board

ALBERT C. Lehman, president of Blaw-Knox Co., Pittsburgh, has been elected to the newly created post of chairman of the board.

✦ ✦ ✦

IRVIN F. Lehman, vice president, has been elected president of the company, and Frank Cordes has been named senior vice president.

✦ ✦ ✦

THe following have been re-elected: Chester H. Lehman, and Robert F. McCloskey, vice presidents; George L. Dumbauld, treasurer; H. B. Loxterman, secretary; B. L. Hirshfield, chairman of the finance committee; Paul W. Keim, assistant treasurer; H. S. Strassburger, assistant treasurer and assistant secretary, and P. A. McCullough, comptroller.

✦ ✦ ✦

L. H. Underwood Back at Sheet & Tube Co. Youngstown Plant

L. H. Underwood, manager of the Chicago district office of the Youngstown Sheet & Tube Company, has been transferred to Youngstown as assistant to W. B. Gillies, vice-president in charge of operations. Mr. Underwood was formerly located in the company's operating department at Campbell.

✦ ✦ ✦

J. D. Williams has been named head of the mechanical department of the Sheet & Tube company at the Brier Hill plant. He has been in the company's employ for 27 years. For 12 years he was in charge of reversing engines for the company.

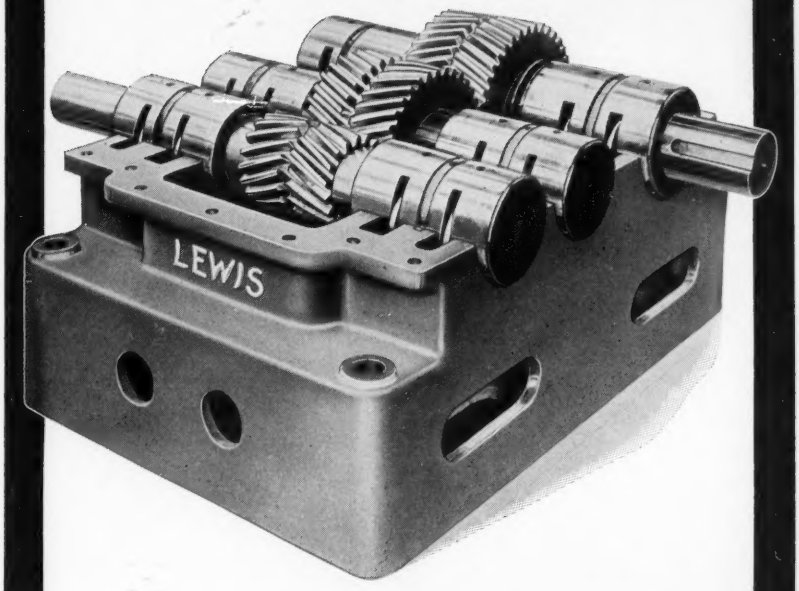
✦ ✦ ✦

F. W. Bierwirth, Manager of Kearny Works of Western Electric Co.

FREDERICK W. Bierwirth has been elected vice president of the Western Electric Co. and manager of the company's Kearny, N. J., works succeeding the late Stanley S. Holmes.

MAKE YOUR PLANS NOW TO COME TO THE WIRE ASSOCIATION MEETING

LEWIS HIGH SPEED GEAR SET



FOR CONTINUOUS ROD MILL

Lewis High Speed Gear Sets are in use where quality and efficiency really count. The largest and most up-to-date rod mill unit in the world utilizes Lewis Gear Sets for driving its roll stands.

Lewis gear housings are of two piece type with special alloy forged steel herringbone cut tooth gears running in babitted shell type or roller bearings. One Lewis gear set is used for driving two roll stands which is a special feature for controlling roll speeds when driven by either individual motors or bevel gear drives. Lewis gear sets are totally enclosed and gears and bearings run continuously in oil.

Lewis Engineers will gladly cooperate with you in designing special machinery to meet your problems.

LEWIS

PITTSBURGH, PA.

LEWIS FOUNDRY & MACHINE CO.

IN ANTARCTICA . . .

OR IN SAHARA . . .

You can DEPEND on this insulated cable lacquer

There is not an imaginable condition for which A & W's cable lacquer has not been *pre-tested*. If it's hot in Sahara . . . it's still hotter in A & W's testing ovens. If it's cold in Antarctica . . . it's yet colder in A & W's sub-zero testing cases.

Developed in our own laboratories, applied in our own lacquering towers, tested and re-tested under the severest conditions possible, with a chemical and technical research background dating back to 1878 . . . no wonder we say that you can DEPEND on this cable lacquer.

It is one of many "tailor-made" products developed by A & W for specific purposes to give more dependable service. Ask us about it. Ask us also about other tailor-made wire and cable lacquers and enamels for various industrial purposes.

AULT & WIBORG CORPORATION
NEW YORK, N.Y. CINCINNATI, OHIO

Joint Meeting of Braiding and Wire Covering Machine Association and The Wire Association

AT the meeting of the directors of the Braiding and Wire Covering Machine Association held Friday, April 12th, 1935, in Providence, R. I., it was voted by that Association to accept the invitation of The Wire Association to join in a joint meeting at Chicago, Illinois, September 30th to October 4th to be arranged along the lines of the meeting held last year.

✦ ✦ ✦

IT will be recalled by those attending last year's meeting, that a most successful session was held at which were present representatives of the principal manufacturers of braiding and covering machinery, together with a large number of representatives of wire companies using such machinery and that much information of value to both the manufacturer and the user was developed at that meeting. It is expected that the 1935 meeting will be even more successful.

✦ ✦ ✦

ALL manufacturers of braided, covered, or stranded wire are invited to attend this session of the Association. For this particular meeting no registration fee will be charged these guests.

✦ ✦ ✦

New Carboloy Booklet Issued

THE **Carboloy Company** has just issued a very handsome booklet entitled "Typical Performance Records of the Carboloy Truing Tool". This booklet gives general information regarding the tool, its parts, performance data, etc. Copies can be obtained by addressing "WIRE & WIRE PRODUCTS".

✦ ✦ ✦

Earl Larsen Now With P. R. Mallory Co.

EARL **Larsen**, formerly metallurgist for the Driver-Harris Company, Harrison, N. J., has been appointed assistant manager in charge of metallurgical research and development of special alloys for the P. R. Mallory Company, Inc., Indianapolis, Indiana.

"Copperweld" Wire

AMONG the older interesting copper products is one known as "copperweld," manufactured by the Copperweld Steel Co., of Glassport, Pa. This consists of a wire with a steel interior and a copper exterior.

✦ ✦ ✦

IT is manufactured by placing a large diameter, round steel billet, forty-eight inches long in a mold which is too large for it. The mold is sealed and placed in a furnace and heated to high temperature. After removal from the furnace, molten copper is poured into the space around the steel billet. As a result, a continuous weld is formed between the copper exterior and the steel interior.

✦ ✦ ✦

THE ingot is thereafter treated as one metal. It is hot-rolled into a wire rod three-eighths of an inch in diameter. This rod is then cold drawn into wire.

✦ ✦ ✦

THE copperweld wire is said to have an electrical conductivity equal to 30 or 40 per cent of solid copper wire of equal diameter. As a result, the copper coating not only serves as a rustproof coating for the wire but can be used as a conductor of electricity. The company reports that the greater part of the signal wires on Class A railroads in the United States are made of copperweld. Large amounts are also used for signal rail bonds.

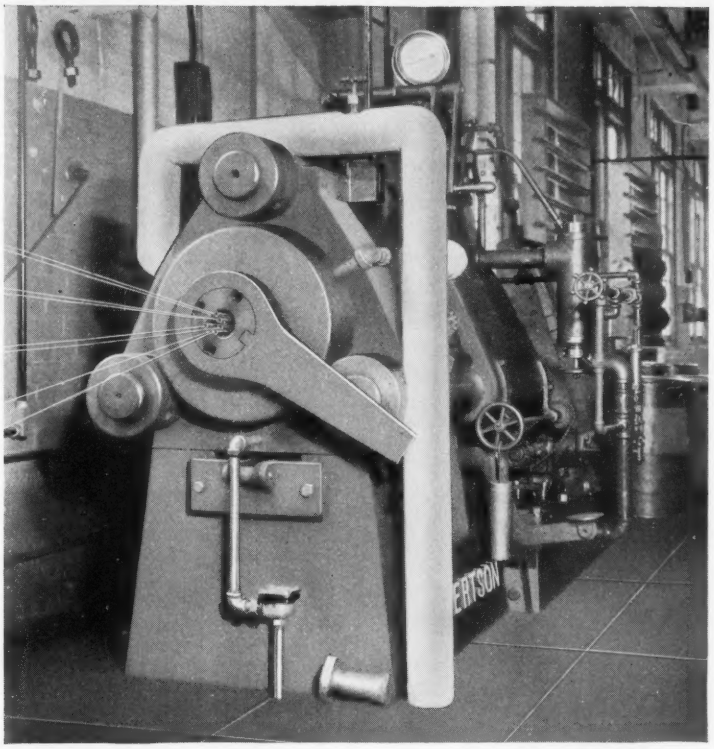
✦ ✦ ✦

FOR long spans in which a wire of high tensile strength and also high conductivity is required a stranded cable is manufactured consisting of both copperweld wires and solid copper wires. The solid copper wires increase the conductivity of the cable while the copperweld wires support them.

Reels And Spools Standardization

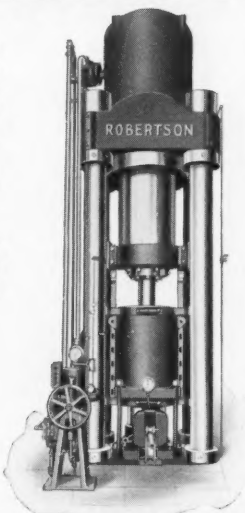
Reprints of the report of this committee as published in the November, 1934, issue of WIRE & WIRE PRODUCTS, outlining the proposed new standards for reels and spools for insulated wire and cable can be obtained for 25c a copy.

The Garlock Packing Co. uses this Robertson 250 ton Horizontal Extrusion Press



This Robertson Press is shown here extruding eight strands of lead wire. This press is also especially efficient for the extrusion of small quantities of Rods, Tubes and miscellaneous shapes of Lead, Tin, Brittania Metal and other Soft Alloys. It occupies a floor space of only 4 ft. by 6 ft. and is "entirely self-contained." The action of the Press is semi-automatic; i. e., after setting the lever in starting position, the Press goes through its extrusion cycle and then returns to its original position, with no further attention needed.

Robertson also makes lead-encasing presses for extruding lead sheath directly onto electrical wires and cables, from ¼" to 5" outside diameter, and also for lead-encasing bare metal wires, rods, and tubes. They are built for hydraulic capacities from 650 to 2500 tons. Write us for full particulars.



Lead Cable Encasing Press

Other Robertson equipment for wire and cable manufacturers includes: Hydraulic Pumps, Melting Furnaces and Pots, Dies and Cores, also Lead Sheath Stripping Machines, and Hydro-pneumatic Accumulators.

John ROBERTSON CO. INC. — Pioneers~Since 1858

125-137 Water Street — Brooklyn, N. Y.

AMERICAN LIME & STONE COMPANY
Bell Mine
Product
WARNER COMPANY—MANAGEMENT

Die Life

A manufacturer states that the length of life of dies at his plant has been doubled since Bell-Mine Pulverized Lime has been used regularly in his processes.

This lime is burned from pure stone that is mined 700 feet under ground. Its production and packaging is under constant skilled chemical supervision. Shipments are made in tight steel drums or in multi-wall strong paper bags.

AMERICAN LIME AND STONE CO.
(OPERATING UNDER N. R. A. LIME CODE)
PLANT and EXECUTIVE OFFICE: BELLEFONTE, PA.
Sales Offices: PITTSBURGH PHILADELPHIA NEW YORK CITY

A SAFE WAY TO BUY *Wire*

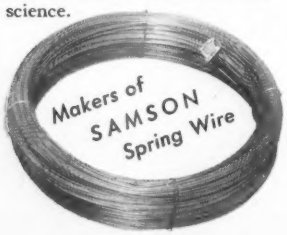
SPRING
BROOM
CLIP
FLORIST
GRAPE TIE
STAPLING
MATTRESS
WEAVING
TELEPHONE

Play safe! Let a Keystone technical man help you select wire with the exact characteristics suited to your needs.

Back of Keystone Wire is long specialized experience, painstaking laboratory and field tests, scientific control and careful inspection throughout all stages of manufacture.

Keystone Wire is made for many purposes—tinned, galvanized, coppered, liquor finish, annealed (low, medium, high carbon) and manufacturers' wire.

Each is a quality product of modern metallurgical art and science.



Keystone Steel & Wire Co., Peoria, Ill.

KEYSTONE WIRE

'Round the World With the Wire Industry

(*Continued from page 200*)

program, which amounts to 350,000 tons for the first quarter of 1935. The position of the machine wire market is reported to be weak.

✦ ✦ ✦

ONE of the repercussions of the transfer of the Saar to Germany was the disintegration of the Continental Tube Cartel which was to have remained in force until 1940. Hopes are entertained that a base of agreement will be found and that the Comptoir for tubes will be reorganized along the same lines as the export comptoirs of the International Steel Cartel, according to this report.

✦ ✦ ✦

Dissolution of the International and Continental Tube Cartels

AT a meeting held in Brussels on March 12, the dissolution of the International and Continental Tube Cartels was decided upon. The groups participating in the Continental Cartel were Germany, France, Belgium, Czechoslovakia, Hungary and Poland; those of the International Cartel were England, the United States, Canada and Sweden. The private agreements between countries will remain in force. The cancellation of the cartel agreements resulted principally from the disparity in exchange rates of the different members. A proposition to remove from the Continental cartel the jurisdiction over the sales on the respective local markets, keeping the agreement in force for the export markets only, also failed. However, an agreement was concluded, through arbitration between the German and French groups, for the transfer of the Sarre tube plant (Acieries et Usines a Tubes de la Sarre), whose quota amounted to 7 percent.

✦ ✦ ✦

Exemption from Duty of Bandsaw Steel Strip in the United Kingdom

BY an order coming into operation on March 7, 1935, bandsaw steel strip 3 to 4 inches wide, and from 19 to 12 gauge (Birming-

ham Wire) in thickness, is to be exempted from import duty in the United Kingdom.

✦ ✦ ✦

Japanese Iron and Steel Prices Depressed

THE iron and steel market in Japan was active during February but prices were severely depressed by the proposed bill to reduce the duty on pig iron and a number of finished steel materials. Production during December totaled 3,000,000 tons, establishing a new high record. Scrap iron imports during 1934 totaled 1,412,000 metric tons, of which the United States supplied 960,000, British India 101,000, Great Britain 95,000, Australia 48,000, and Netherland India 34,000.

✦ ✦ ✦

In Finland Imported Electric-Light Bulbs Must Show Country of Origin

UNDER authority of a Finnish law of November 16, 1934, the Ministry of Commerce and Industry has issued an order requiring an indication of the country of origin, effective March 1, 1935, on incandescent electric light bulbs measuring less than 50 millimeters in cross-section and on bulbs of dull, colored, and frosted glass, either by grinding into the glass or by ineradicable printing on the metal base, in letters at least 2 millimeters high. Origin must likewise be shown on the packing in letters at least 3 millimeters high, according to "Tullstyrelsens Cirkular", February 1, 1935.

✦ ✦ ✦

Editorial Correction

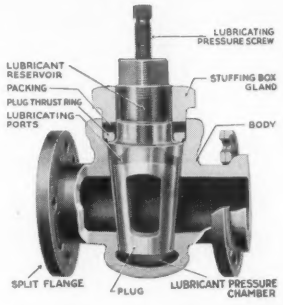
ON page 149 of the April issue of WIRE AND WIRE PRODUCTS a section of 3″ Locked Coil Tramway Cable was illustrated and was indicated as being the product of the General Cable Corporation. This is incorrect as the cable was produced by the American Steel and Wire Co., and exhibited by the Columbia Steel Company.

MAKE YOUR PLANS NOW TO COME TO THE WIRE ASSOCIATION MEETING

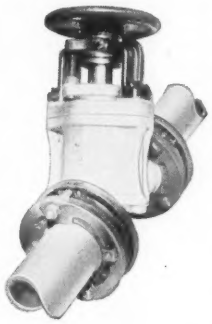
Who's the Boss—You or the Acid?

If the Acid has you running around, plugging up leaks here and there, replacing valves that just can't take it, repairing corroded valves, then the Acid is Boss.

But here's how you can change that—**change to valves that don't corrode;** that keep the acid where it belongs—in the pipe line; valves that are made solely for acid, having no other purpose in their long and useful life but that of controlling the flow of corrosive liquids.



Cross-section DURIRON-NORDSTROM Lubricated Valve. Sizes 1″ to 6″.



(Left) Y Valve, sizes 1″ to 6″.

For sulphuric acid, use "DURIRON" valves — for muriatic acid, use "DURICHLOR" valves.

They put the balance of power in your hands—and incidentally, save you money on maintenance expense.

Write for Bulletins 140, 161, 400.

The Duriron Company, Inc.

445 N. Findlay St. **Dayton, Ohio**

— DESCO —

A PICKLING STABILIZER ▲ ▲ ▲ FOR CARBON STEELS ▲ ▲ ▲

The strong passivating effect of this excellent inhibitor insures a bright finish and forms a sound basis for a bright drawing technique—

DELANY CHEMICAL CO.

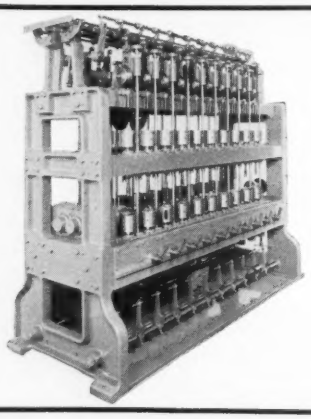
COTTMAN AND MILNOR STS.,
PHILADELPHIA, PA.

Learn about PARALAN

Paralan will give your finished wire and wire products protection from atmospheric corrosion in the mill and in shipping. Paralan-coated wire can be spot welded or soldered without cleaning. Also, Paralan leaves surfaces in good condition for all types of finishes—enameling, japanning, lacquering, plating, etc.

Write for further information. We may be able to solve your difficulties.

AMERICAN LANOLIN CORP.
LAWRENCE, MASSACHUSETTS



LOWEST COST INSULATED WIRE
is produced on the
HIGH SPEED
Ball-Bearing Dynamic Balance
Cotton, Silk or Paper Wire Covering Machines
made by

EST. 1855 AIMCo INC. 1915
"American" INSULATING MACHINERY COMPANY
REG. U.S. PAT. OFF.
517 West Huntingdon St.
PHILADELPHIA PENNSYLVANIA U.S.A.

Model OD-20 BB for wire .010 to .003 inch.

STEELSKIN

REG. U. S. PAT. OFFICE

For High or Low Carbon Wire

WIRE DRAWING SOAPS

Established 30 years

R. H. MILLER CO., Inc. Homer, N.Y.

Patents—Trade Marks

Before disclosing your inventions to anyone send for blank form "Evidence of Conception" and instructions "How to Establish Your Rights".

All cases submitted given personal attention by members of the firm. Information and booklet free.

Lancaster, Allwine & Rommel

PATENT LAW OFFICES

Suite 438, Bowen Building 815-15th St., N.W. Washington, D. C.

Two New Network Cables

TWO new network cables one a leaded-type cable for use in ducts and the other a non-metallic cable for 600-volt service, have been made available by the General Electric Company.

✦ ✦ ✦

IN the leaded-type cable, a layer of Glyptal treated cloth covers the conductor and two layers of asbestos cover the Glyptal cloth. Both the cloth and the asbestos are treated with Pyranol and the whole is enclosed in a lead sheath.

✦ ✦ ✦

THE General Electric Glyptal resin used in this cable has a unique molecular structure that makes it the ideal base for insulating compounds that must be tough, resilient, elastic, tenacious, and not readily decomposed. Pyranol is a General Electric liquid dielectric which is non-inflammable, will not give off explosive gases, and possesses high dielectric strength.

✦ ✦ ✦

THE new leaded-type cable is the first in which the unusual mechanical and electrical properties of both Glyptal cloth insulation and Pyranol have been brought together to provide a network cable that is absolutely flameproof and whose insulation will not give off explosive gases.

✦ ✦ ✦

THE new non-metallic cable for 600-volt service features a Glyptal compound sheath and a rubber compound insulation which is highly moisture-resistant. The properties of the Glyptal sheath make this cable suitable for use in oily or alkaline locations where protection against abrasion is not necessary; and because of the extremely low water-absorption factor of the rubber compound used for the insulation—which does not exceed 0.015 gram per inch—the new cable can be used in ducts or buried directly in the ground. When furnished with a treated-braid re-enforcement, it can be used as a portable cable.

MAKE YOUR PLANS NOW TO COME TO THE WIRE ASSOCIATION MEETING

New Research Book on Grinding Wheel Selection

THE **Norton Company** of Worcester, Mass., announces the publication of a most complete research on Grinding Wheel Information and Selection.

This is in the form of a 60 page booklet with a special wire binder enabling the reader to use the publication on any surface with the facing pages always remaining flat.

✦ ✦ ✦

THE contents of the book include grinding wheel information, wheel specifications, the selection of wheel specifications, influential variable factors, tables of grinding wheel recommendations, operating rules and general data. Copies may be obtained by addressing "WIRE & WIRE PRODUCTS".

✦ ✦ ✦

Keystone Announces Reorganization

UNDER date of April 27th a telegram was received at the office of WIRE AND WIRE PRODUCTS announcing that the Board of Directors of the Keystone Steel and Wire Company had met April 26th and completely reorganized the management.

THE newly elected officers are: **W. H. Sommer, President; R. E. Sommer, Vice President and General Manager; C. W. Laporte, Vice President; D. P. Sommer, Vice President and General Superintendent; Henry G. Sommer, Executive Vice President and Treasurer; W. O. Fritze, Assistant Treasurer.**

OF the above group **Henry G. Sommer** remains over from the previous management.

THE following were the officers removed:

W. C. Buchanan, President and General Manager; W. W. Barton, Vice President; E. P. Kastien, General Superintendent and Purchasing Agent.

IN addition **Hiram E. Todd,** and **A. G. Heidrich** were removed from the executive committee and **John V. W. Reynders** was removed as consulting engineer.

THE above telegram of announcement was signed by **W. H. Sommer,** President, but at the time of publication no further details are available.

Doing One Thing Well

PRODUCING THE BEST INHIBITOR

100% PURE

TWENTY YEARS SUCCESS WITH THE STEEL COMPANIES
United States; Canada; and Europe.

NEPowder 100% Pure. Contains No Diluent.
NEP Liquid; The Strongest Liquid Produced.

IMMEDIATE SHIPMENT from stock either carloads or 50 gallon drums

THE WILLIAM M. PARKIN CO.
Chemical Engineers to the Steel Industry
Pittsburgh, Pa.
In Steel since 1860

Striking Packages Sell Tacks

UTILITY and saleability are the two most striking characteristics of the completely redesigned packages and cartons in which the tack products of Republic Steel Corporation, Chicago, Ill., are now packed. All tacks are packed in packages of distinctive design which identify the kind, size and

finish of tack at the first glance. This makes it much easier for the retailer to handle the packages and, at the same time, enables the user to select the proper box from a miscellaneous assortment without the slightest hesitancy.

✦ ✦ ✦

CARPET tacks are packed in blue and yellow 1/8 and 1/4 lb. packages in special matching cartons which, when opened, make fast-selling counter displays. Many other tacks and small cut nails are packed in attractive blue and white packages also put up in cartons which make sales-compelling counter displays.

✦ ✦ ✦

DEALERS report noticeable sales increases from use of the new line of packages and display cartons.

EFFICIENT PICKLING
Assured With
RODINE

Rodine saves acid and metal, prevents acid brittleness, and reduces acid fumes.

Samples and complete information sent on request.

AMERICAN CHEMICAL PAINT CO.
Ambler, Pa.
Detroit Office and Warehouse
6339 Palmer Ave.; E.

Continuous Straightening and Cutting Machinery
With
FLYING SHEAR
for round and shaped wire.

✦ ✦ ✦

THE HALLDEN MACHINE COMPANY
THOMASTON CONNECTICUT

BALLOFFET
SINCE 1870

Balloffet Diamond Wire Dies Co., Inc.
13-15 East 22nd Street
New York

Wire Mill Equipment, Stranding, Insulating, Drawing, Welding
Thomson-Judd Wire Machinery Co.
Subsidiary of
Thomson-Gibb Electric Welding Co.
Lynn, Massachusetts.

Broden Construction Co.
Wire Mill and Cold Rolling Equipment
10255 Harvard Ave.
CLEVELAND, OHIO

WIRE MILL EQUIPMENT
MORGAN CONSTRUCTION CO.
WORCESTER, MASS.

RUESCH
Machinery For
Wire, Tube, And Brass Mills
409 Mulberry St., Newark, N. J.

WIRE DRAWING MACHINERY AND EQUIPMENT
Rod Frames—16″ Frames, 8″ Frames —Take-Up Frames, Wire Pointers—Puller Tongs.
General Castings for Wire Mill use. Circulars on Request.
E. J. SCUDDER FOUNDRY & MACHINE CO.
TRENTON, N. J.

HIGH SPEED
Welding Wire Straightening and Cutting Machinery
Round Wire Straightening and Cutting Machinery
Flat Wire Straightening and Cutting Machinery
Roll and Rotary Wire Straighteners
THE F. B. SHUSTER CO.
New Haven, Conn.
Straightener Specialists Since 1866

VIANNEY
1889—Awarded Gold Medal, the only prize for diamond dies at Paris Exhibition.

Ball and Roller Bearings

USERS of Anti-Friction Bearings now may procure complete closures, finished and ready to use, for approximately 150 sizes of ball and tapered roller bearings in a number of sizes and types to meet many design combinations. Bolt fastening dimensions have been established and for each group of bearings having similar diameters a number of parts, all having identically located holes, provided. Fourteen sizes of cast iron covers for completely closing the bearing housings as well as open covers of various types are included in the line. Among the latter are covers carrying felts, covers with flingers and covers for the accommodation of standard leather or composition oil seals. Numerous shaft extension sizes can be utilized and the varying degrees of inside space offered permits mounting bearings with or without locknuts, in fixed or floating positions and with proper abutting shoulder diameters. A number of the parts are fitted with lubricant and cleaning openings eliminating the expense of these holes in the main housings. Data Sheets showing detailed dimensions are procurable from The Bearing Appliance Company, Ardmore, Pa.

✦ ✦ ✦

GEORGE Scherr Co., New York, N. Y., announce a preliminary bulletin on a new Wire Gauging Microscope and Projector which has just been developed by the Zeiss Works in Jena.

It is believed that this new instrument would be of interest to manufacturers who make or use precision wire smaller in diameter than .0200″.

Copies of the bulletin can be obtained by addressing "WIRE & WIRE PRODUCTS.

WANTED
Used Wire or Hose Wrapping Machine, For Use With Crinkled Paper.
State Price.
Address Box 101
c/o Wire & Wire Products
17 E. 42nd St. New York, N. Y.

Kenneth B. Lewis
CONSULTING ENGINEER
Wire Mill Equipment, Layout and Practice
17 East 42nd St. New York City
43 Midland St. Worcester, Mass.
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Phone 5-6033

New Products Development Corp.
Consulting and Research Engineers
Specializing in developing new wire products, manufacture of wire, insulated wire and high tension cable.
Standard and special equipments developed, built and installed. Any problem you may have, we solve it if you consult us.
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PAPER CABLE FILLER
FOLDED PAPER FLATS
PAPER INSULATION YARNS
E. W. TWITCHELL, INC.
Formerly National Patent Reed Co.
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ZINC WIRE
THE PLATT BROS. & CO.
WATERBURY, CONN.

BISCO
TUNGSTEN CARBIDE DIES
For Wire, Rod and Tubing
Round and Special Shapes
TUNGSTEN ELECTRIC CORP.
BISSETT STEEL DIVISION
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Wire Drawing Diamond Dies
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WIRE DIE CORPORATION
300 W. 56th ST., NEW YORK
Tel. Col. 5-1340

BUYERS' GUIDE

For more complete information, consult the annual Directory, Index & Buyers' Guide.

ABRASIVES—
Norton Co., Worcester, Mass.

ANNEALING FURNACES
See Furnaces—Various Headings

ANNEALING POTS AND BOXES
Scudder, E. J., Fdry & Machine Co., Trenton, N. J.

ARMORING EQUIPMENT
Amer. Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

BAKERS
Morgan Construction Co., Worcester, Mass.
Morrison Engineering Co., Cleveland, O.
Vaughn Machinery Co., Cuyahoga Falls, O.

BORON CARBIDE—
Norton Co., Worcester, Mass.

CEMENTS—Refractory
Norton Co., Worcester, Mass.

CHEMICALS—Cleaning
American Chemical Paint Co., Ambler, Pa.
Delany Chemical Co., Tacony Station, Philadelphia, Pa.

CLEANING & PICKLING EQUIPMENT
Broden Construction Co., Cleveland, O.
Duriron Co., The, Dayton, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

COATING—Protective
American Lanolin Corp., Lawrence, Mass.

COILERS—Sheet, Strip and Wire
Borden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
H. J. Ruesch Machine Co., Newark, N. J.

CONDUITS—Iron and Steel
Youngstown Sheet & Tube Co., Youngstown, Ohio.

CRANES—Wire Mill
Cleveland Electric Tramrail Div., of Cleveland Crane & Eng. Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

DIES—Diamond
Balloffet Diamond Wire Dies Co., Inc., N. Y. C.
Cochaud Wire Die Co., New York.
Driver-Harris Co., Harrison, N. J.
Kelly Wire Die Corp., New York. N. Y.
Union Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York.

DIES—Lead Extrusion
John Robertson Co., Brooklyn, N. Y.

DIES—Repairs & Re-Cutting
Cochaud Wire Die Corp., New York.
Driver-Harris Co., Harrison, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York. N. Y.
Union Wire Die Corp., New York, N. Y.
Vianney Wire Die Wks., N. Y.

DIES—Rod and Tube Drawing
Bissett Steel Co., Cleveland, O.
Carboloy Co., Inc., Newark, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Union Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York, N. Y.

DIES—Tantalum Carbide
Kelly Wire Die Corp., New York, N. Y.
Vanadium-Alloys Steel Co., Chicago, Ill.

DIES—Tungsten Carbide
Carboloy Co., Inc., Newark, N. J.
Driver-Harris Co., Harrison, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Union Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York, N. Y.

DRAW BENCHES
H. J. Ruesch Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.

ENAMELS and LACQUERS—
Ault & Wiborg Corp., Cincinnati, O.

ENGINEER—Consulting Wire Mill
Lewis, Kenneth B., New York, N. Y.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FILLERS—Paper for Cable
E. W. Twitchell, Inc., Phila., Pa.

FURNACES—Annealing
Electric Furnace Co., Salem, O.
Surface Combustion Co., Toledo, O.

FURNACES—Automatic
Electric Furnace Co., Salem, O.
Surface Combustion Co., Toledo, O.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, O.
Surface Combustion Co., Toledo, O.

FURNACES—Electric
Electric Furnace Co., Salem, O.
Surface Combustion Co., Toledo, O.

FURNACES—Lead Melting
Electric Furnace Co., Salem, O.
John Robertson Co., Brooklyn, N. Y.

FURNACES—Non-Oxidizing
Electric Furnace Co., Salem, O.
Surface Combustion Co., Toledo, O.

FURNACES—Wire, Strip and Sheet
Electric Furnace Co., Salem, O.
Surface Combustion Co., Toledo, O.

GEARS—Wire Mill
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Lewis Foundry & Machine Co., Pittsburgh, Pa.

GRINDERS—Roll
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Norton Co., Worcester, Mass.

HANDLING EQUIPMENT—Material
Cleveland Electric Tramrail, Div. of Cleveland Crane & Eng. Co., Wickliffe, O.

HOISTS—
Cleveland Electric Tramrail Div., of Cleveland Crane & Eng. Co., Cleveland, O.

INHIBITORS
American Chemical Paint Co., Ambler, Pa.
Delany Chemical Co., Tacony Station, Philadelphia. Pa.
Parkin Co., The Wm., Pittsburgh, Pa.

INSULATED CABLE LACQUERS and ENAMELS—
Ault & Wiborg Corp., Cincinnati, O.

INSULATION—Cable or Cable Filler
E. W. Twitchell, Inc., Phila., Pa.

LATHES—Die Reaming
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

LIME—Pulverized
Amer. Lime & Stone Co., Bellefonte, Pa.

LUBRICANTS—Wire Drawing
R. H. Miller Co., Homer, N. Y.

MACHINERY—Armoring (Cable, Wire Hose)
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
John Robertson Co., Brooklyn, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Braiding
New England Butt. Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Brazing
Thomson-Judd Wire Machinery Co., Lynn, Mass.

MACHINERY—Bunching
Amer. Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cable, Electric
American Insulating Machinery Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Company, Paterson, N. J.

MACHINERY—Chain Making
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Closing
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Coilers
Broden Const. Co., Cleveland, O.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester. Mass.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cold Heading With Wire Drawing Attachment
Ajax Manufacturing Co., Cleveland, O.

MACHINERY—Copper Wire Drawing and Rolling
Farrel-Birmingham Co., Inc., Ansonia, Conn.
H. J. Ruesch Machine Co., Newark, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Cutting
Broden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Hallden Machine Co., Thomaston, Conn.
F. B. Shuster Co., New Haven, Conn.
Sleeper & Hartley, Worcester, Mass.

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.

MACHINERY—Extruding
John Robertson Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

MACHINERY—Flat Wire
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Forming
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Galvanizing Wire
Broden Construction Co., Cleveland, O.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Gang Winders
H. J. Ruesch Machine Co., Newark, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., Worcester, Mass.

MACHINERY—Insulating
American Insulating Machinery Co., Phila.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lead Encasing Presses, etc.
John Robertson Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
John Robertson Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Measuring Wire & Cable
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Panning
American Insulating Machinery Co., Phila.

MACHINERY—Pointing
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
E. J. Scudder Foundry & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

BUYERS' GUIDE, Continued

MACHINERY—Rod Mill
Broden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Morgan Const. Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
Lewis F'dry & Machine Co., Pittsburgh, Pa.

MACHINERY—Rolling Mill
Broden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Lewis F'dry & Machine Co., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark. N. J.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Rubber Strip Covering
Farrel-Birmingham Co., Inc., Ansonia, Conn.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Rubber Tubing and Straining
Farrel-Birmingham Co., Inc., Ansonia, Conn.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Screw Wire
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila. Pa.
Broden Construction Co., Cleveland, O.
H. J. Ruesch Machine Co., Newark, N. J.
E. J. Scudder Foundry and Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spooling
American Insulating Machinery Co., Phila.
Fidelity Machine Co., Philadelphia, Pa
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spring Making
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Broden Construction Co., Cleveland, O.
Hallden Machine Co., Thomaston, Conn.
H. J. Ruesch Machine Co., Newark, N. J.
F. B. Shuster, New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Stranding
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Broden Const. Co., Cleveland, O.
Lewis F'dry & Machine Co., Pittsburgh, Pa.
H. J. Ruesch Machine Co., Newark, N. J.

MACHINERY—Swaging
H. J. Ruesch Machine Co., Newark, N. J.
Sleeper & Hartley, Worcester, Mass.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Taping
Amer. Insulating Mach. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Tinsel Rolling Mills
Amer. Insulating Mach'y Co., Phila., Pa.

MACHINERY—Trolley Wire
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
H. J. Ruesch Machine Co., Newark, N. J.

MACHINERY—Welding Wire
Micro Products Co., Chicago, Ill.
F. B. Shuster Co., New Haven, Conn.
Thomson-Judd Wire Machinery Co., Lynn, Mass.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Drawing
American Insulating Machinery Co., Phila.
Broden Const. Co., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
H. J. Ruesch Machine Co., Newark, N. J.
E. J. Scudder Foundry & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Thomson-Judd Wire Machinery Co., Lynn, Mass.
Watson Machine Company, Paterson, N. J.

MACHINERY—Wire Tinning
American Insulating Mach'y Co., Phila., Pa.

MATERIAL HANDLING EQUIPMENT—
Cleveland Electric Tramrail Div., of Cleveland Crane & Eng. Co., Cleveland, O.

PAPER—Insulating
E. W. Twitchell, Inc., Phila., Pa.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Delany Chemical Co., Tacony Station, Philadelphia, Pa.
Parkin Co., The Wm., Pittsburgh, Pa.

PRESSES—Hydraulic and Mechanical
Farrel-Birmingham Co., Inc., Ansonia, Conn.
John Robertson Co., Brooklyn, N. Y.

POTS—Lead Melting
John Robertson Co., Brooklyn, N. Y.

PRESSES—Lead Encasing
John Robertson Co., Brooklyn, N. Y.

PRESSES—Lead Extrusion
John Robertson Co., Brooklyn, N. Y.

PULLERS—Wire
E. J. Scudder Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

PUMPS—Hydraulic
John Robertson Co., Brooklyn, N. Y.

REEL AND TENSION STAND—
Sleeper & Hartley, Inc., Worcester, Mass.

REEL CRUTCHES
Watson Machine Co., Paterson, N. J.

REFRACTORIES—High Temperature
Norton Co., Worcester, Mass.

ROD BAKERS—
Morrison Engineering Co., Cleveland, O.

RODS—Wire—Non Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire—Steel
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Republic Steel Co., Youngstown, O.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

ROLLING MILLS—See Machinery—Rolling Mill

ROLLS—
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Lewis F'dry & Machine Co., Pittsburgh, Pa.

RUST PROOF COMPOUND
American Lanolin Co., Lawrence, Mass.

SHEET—Steel
Continental Steel Corp., Kokomo, Ind.
Republic Steel Co., Youngstown, O.
Superior Sheet Steel Co., Canton, O.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

SOAPS—Wire Drawing
R. H. Miller Co., Homer, N. Y.

STRIP—Brass, Zinc and Non Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

STRIP—Steel
Continental Steel Corp., Kokomo, Ind.
Driver-Harris Co., Harrison, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.
Republic Steel Co., Youngstown, O.
Wheeling Steel Corp., Wheeling, W. Va.

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TREADS—Safety
Norton Co., Worcester, Mass.

TRUCKS
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

TUBE BENDERS AND FORMERS
H. J. Ruesch Machine Co., Newark, N. J.

VALVES AND FITTINGS—Acid Proof
Duriron Co., The, Dayton, O.

VULCANIZERS
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS
American Insulating Mach'y Co., Phila., Pa.

WIRE—Enameled For Coils
Winsted, Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
Continental Steel Co., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Republic Steel Co., Youngstown, O.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, Ohio

WIRE—Nickel Silver and Phosphor Bronze
Hudson Wire Company, Ossining, N. Y.

WIRE—Non Ferrous to Specification
Hudson Wire Co., Ossining, N. Y.
Winsted, Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Spring
Continental Steel Corp., Kokomo, Ind.
Keystone Steel and Wire Co., Peoria, Ill.
Republic Steel Co., Youngstown, O.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Republic Steel Co., Youngstown, O.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE AND STRIP—Brass, Zinc
Platt Bros. & Co., The, Waterbury, Conn.

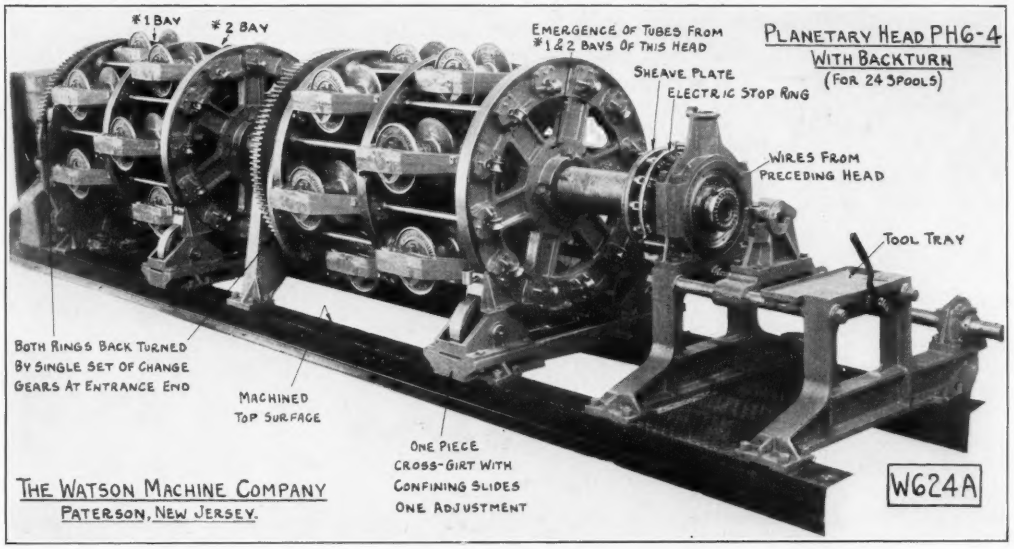
This is a carefully classified index of concerns who specialize in this industry and who advertise regularly in WIRE & WIRE PRODUCTS. Please mention WIRE when writing to these firms.

THE WATSON MACHINE COMPANY

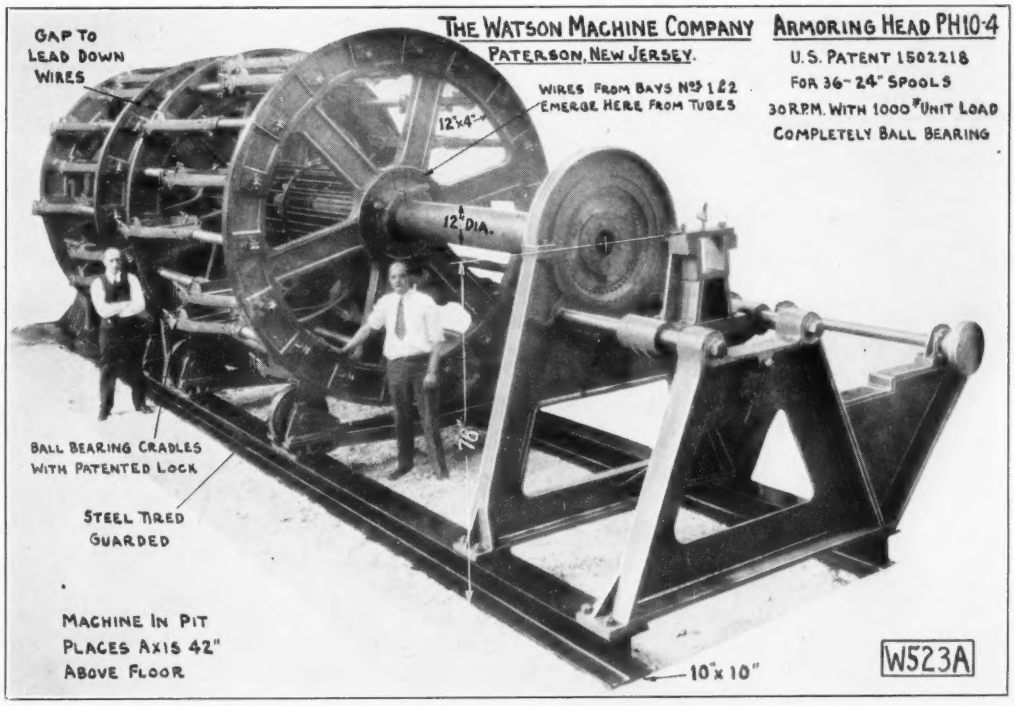
ESTABLISHED 1845

PATERSON, NEW JERSEY, U. S. A.

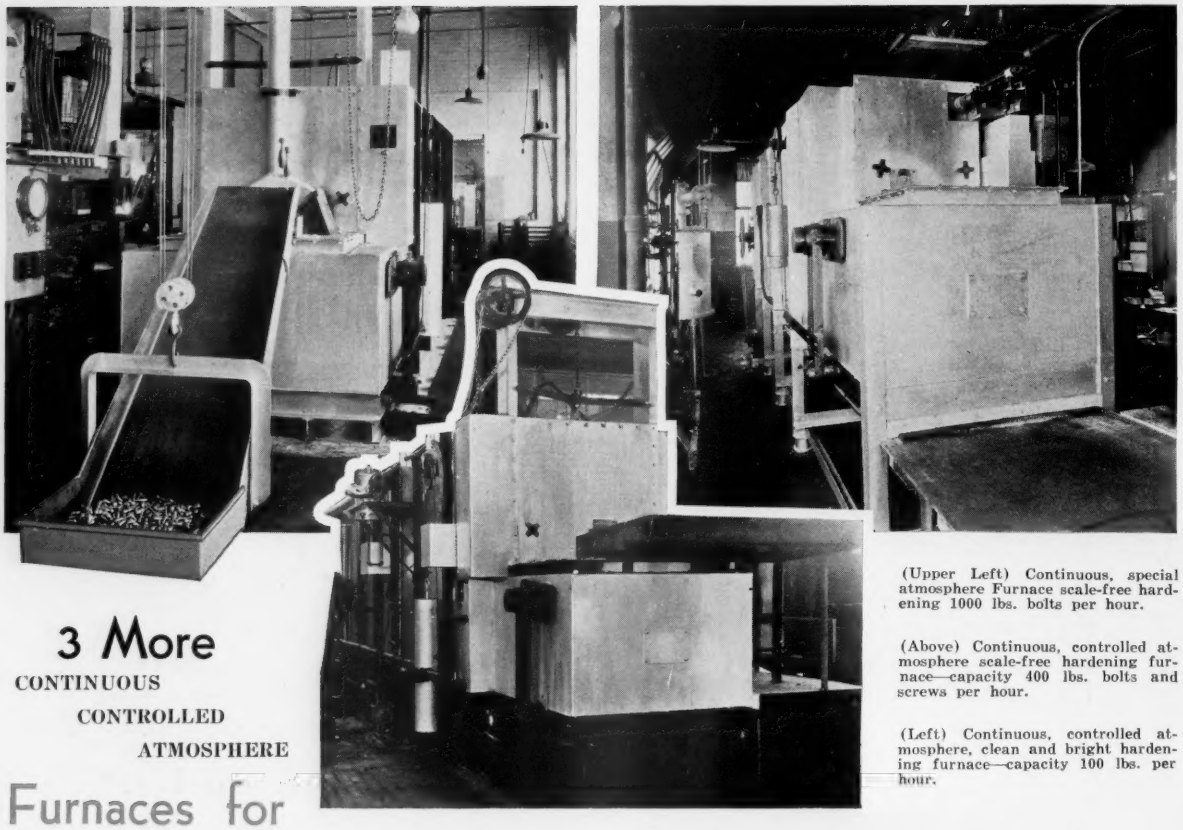
ENGINEERS - FOUNDERS - MACHINISTS


#1 BAY
#2 BAY
EMERGENCE OF TUBES FROM #1 & 2 BAYS OF THIS HEAD
PLANETARY HEAD PH6-4
WITH BACKTURN
(FOR 24 SPOOLS)
SHEAVE PLATE
ELECTRIC STOP RING
WIRES FROM PRECEDING HEAD
TOOL TRAY
BOTH RINGS BACK TURNED BY SINGLE SET OF CHANGE GEARS AT ENTRANCE END
MACHINED TOP SURFACE
ONE PIECE CROSS-GIRT WITH CONFINING SLIDES ONE ADJUSTMENT
THE WATSON MACHINE COMPANY
PATERSON, NEW JERSEY.
W624A

PLANETARY HORIZONTAL STRANDING HEADS in 100, 250 and 500 pound series; for 6, 12, 18, 24, 30 and 36 spools in each series. All Anti-Friction Bearings (including Cradle Necks), with positive elimination of spool side-slap allowing highest speeds. Automatic stops and brakes, low wire lead angles, positive locks preventing operation with unlocked spools. Lang lay attachment at low extra cost.


GAP TO LEAD DOWN WIRES
THE WATSON MACHINE COMPANY
PATERSON, NEW JERSEY.
ARMORING HEAD PH10-4
U.S. PATENT 1502218
FOR 36-24" SPOOLS
30 R.P.M. WITH 1000# UNIT LOAD
COMPLETELY BALL BEARING
WIRES FROM BAYS Nos 1 & 2 EMERGE HERE FROM TUBES
12"x42"
12" DIA.
BALL BEARING CRADLES WITH PATENTED LOCK
STEEL TIRED GUARDED
MACHINE IN PIT PLACES AXIS 42" ABOVE FLOOR
10"x 10"
W523A

PLANETARY HORIZONTAL ARMORING HEADS in 500 and 1000 pound series, for up to 54 spools in each series. Same construction as on Stranding Heads.



(Upper Left) Continuous, special atmosphere Furnace scale-free hardening 1000 lbs. bolts per hour.

(Above) Continuous, controlled atmosphere scale-free hardening furnace—capacity 400 lbs. bolts and screws per hour.

(Left) Continuous, controlled atmosphere, clean and bright hardening furnace—capacity 100 lbs. per hour.

3 More

CONTINUOUS
CONTROLLED
ATMOSPHERE

Furnaces for Scale-Free Heat Treating and Clean and Bright Hardening Bolts, Screws, etc.

For over seven years we have been building continuous chain belt conveyor type furnaces. These furnaces are outstanding for their rugged dependable conveyor construction and for their uniform, economical heat treatment of miscellaneous small and medium size parts and products.

This same type furnace has now been designed for controlled atmosphere for the continuous scale-free heat treatment, and clean and bright hardening of bolts, nuts, screws and other miscellaneous finished part and products. Three of the furnaces are shown above.

The scale-free heating of material—particularly threaded parts such as bolts and screws—allows for closer manufacturing limits than previously possible, and has resulted in a superior product at no appreciable increase in cost. The several installations made are showing rather remarkable results.
We will be glad to send data on this type or on furnaces for any other process in which you may be interested.

Other outstanding controlled atmosphere installations include continuous furnaces for copper brazing, and bright and clean annealing stampings, tubing, wire, sheet, strip, and other ferrous and non-ferrous products.

We specialize on building fuel-fired and electric furnaces to fit the customers' requirement and will be glad to work with you on any of your furnace problems—for any process.

THE ELECTRIC FURNACE CO.

SALEM, OHIO.

Fuel Fired Furnaces

Electric Furnaces